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EFFECT OF SEED PIECE VARIABLES ON
PERFORMANCE CHARACTERISTICS OF POTATO PLANTERS

University — Université

UNIVERSITY OF ALBERTA

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée

M. Sc.

Year this degree conferred — Année d'obtention de ce grade	Name of Supervisor — Nom du directeur de thèse
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EFFECT OF SEED PIECE VARIABLES ON PERFORMANCE CHARACTERISTICS OF POTATO PLANTERS

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

DEPARTMENT OF AGRICULTURAL ENGINEERING

EDMONTON, ALBERTA

SPRING, 1981

THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR SURENDAR KUMAR LIKHYANI

TITLE OF THESIS EFFECT OF SEED PIECE VARIABLES ON PERFORMANCE CHARACTERISTICS OF POTATO PLANTERS

DEGREE FOR WHICH THESIS WAS PRESENTED MASTER OF SCIENCE

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ABSTRACT

Performance characteristics of pick type and cup type potato planters were compared with regard to their distribution pattern of seed placement. Their performance was observed by varying planter space settings, planter speeds, cultivars and sizes and shapes of seed pieces. Seed placement was measured over a distance of 50 metres. Seeds classified as singles, doubles, misses and double misses were observed for each of the variables. Main comparisons were done for the seed pieces spaced as singles because that spacing was considered ideal for plant growth.

End pieces gave a higher percentage of singles and more consistent results than center cut seed pieces. Performance of the pick type planter was generally better than the cup type planter. There was a higher percentage of singles with the pick type planter than the cup type planter.

An increase in planter speed resulted in an increase in percentage of singles for the pick type planter but there was a sharp decrease with the cup type planter.

The coefficient of variation for the pick type planter was lower than the cup type planter.

The seed cultivars and the size of seed pieces had no influence on the performance of the planters.

The average percentage of double spaced seed pieces obtained were the same for the pick type planter and the cup type planter.

The average percentage of misses were very similar for the pick type and the cup type planters.

A higher percentage of double missed seed pieces was obtained with the cup type planter than with the pick type planter.

ACKNOWLEDGEMENTS

I would like to express my sincere thanks and gratitude to my supervisor, Dr.K.W.Domier for his valuable advice and guidance throughout this project.

I would like to thank Dr.Wm.T.Andrew for providing valuable advice in the planning of this project.

I would also like to thank Dr.S.Zalik for his assistance in the statistical analysis of the data.

The assistance offered by Darcy Kusler and Norman Flore for carrying out the field tests is highly appreciated.

Thanks also to the Plant Science department for use of their facilities and the McConnell planter and to Visser Bros. for use of their Acme planter.

The financial assistance provided by the Alberta Agricultural Research Trust is greatfully appreciated.

In conclusion I would like to thank my wife Promila and son Punit for their understanding and patience throughout the duration of my program.

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1. INTRODUCTION

Modern planting machines have to a great extent achieved the objective of speedy planting operation and reduction in manpower requirement. Various types of planting equipment are available in the market but most of the studies done are in the area of improvements in the planting efficiencies of the existing planters.

1.1 The problem

The most common problem with present day planting equipment is the improper placement of seed pieces into the soil. An ideal planter's operation should involve picking up of the seed pieces from the picking unit at the rate of one at a time and planting the seed piece into the soil at the correct spacing interval. As it is very difficult to obtain uniform size and shape of seed pieces, the planters not only have to work under a wide range of field conditions but also are required to handle various kinds of seed pieces. Seed tubers can be graded for their uniformity in size and shape but when they are fed through cutters for seed pieces, all kinds of shapes and sizes are obtained. They could be in shapes of center cut, end pieces, longitudinal etc. and in different sizes. When these seed pieces are picked up by the cups in a cup type planter, there could either be one or more seed pieces in a cup or none at all depending upon the way they are picked up by the cups. Similarly picks in a

pick type planter can also either miss or pick up more than one seed piece at a time. The physiological condition of the seed pieces also influences the performance of a planter, for example seed pieces may stick together or to the hopper. These factors limit the performance of the planter which results in irregular seed placement causing either skips or doubles. In addition, seed pieces held in the hopper due to sticking and bridging action could even result in a long row of missing plants.

1.2 The objective

The objective of this thesis was to identify if any particular size and/or shape of seed pieces was better adapted for a particular type of planter under various operating conditions.

As pick type and cup type planters are commonly used in this area, they were selected for studying the effect of the above variables on seed distribution patterns.

1.3 Methodology

The observations for comparing the seed distribution pattern in a single row were carried out by changing variables in equipment and seed pieces.

The equipment variables were:

1. Speed
2. Spacing

and the variables with seed pieces were:

1. Seed cultivar
2. Size of seed
3. Shape of seed

Two different space settings were used for both pick and cup type planters. Therefore, a planter with two different space settings was considered as two different planters. The experiment was set up as a 4x2x2x2x2 factorial with 5 replications.

Seed placement was measured over a distance of 50 metres. Seed piece spacing was classified as singles, doubles, misses, and double misses for each of the variables. The placement of seed pieces as singles was considered optimum because plants growing at that spacing would neither be competing with each other nor would tend to result in loss of yield due to missing plants.

2. REVIEW OF LITERATURE

Ideally, a potato planter should be capable of accurate placement of seed pieces of various sizes and shapes at a predetermined space setting. With most early machines the seed pieces were placed by the operator into cups or pockets situated on the periphery of a wheel which carried them to the planting shoe where they were dropped into the soil. The main disadvantage of these machines was their slow forward speed which was limited by the rate at which the operators could place seed pieces in the pockets of the wheels. Faster work rates and lower labor requirements had therefore become the principle aim in planter design. Later developments brought automatic planting machines which could do the planting at a much faster rate with a reduced labor requirement.

2.1 Planting machinery

In North America, three general types of potato planters are used commercially : the automatic pick, the assisted feed, and the cup type. The automatic pick type is most widely used . This planter can be operated at higher speeds than those of the other types and requires less man power to operate. These planters can be operated at the rate of 8-10 km/h. Planters of this type operate most efficiently when the seed potatoes are cut in blocky pieces of uniform size. Pricks made by the pickers of the machine may spread

disease-producing organisms and viruses from one piece to another. A much larger area can be planted in a day with a pick type planter than with an assisted feed type, but the assisted feed type usually insures a better stand of potatoes, (Kehr et al.1964). The assisted feed planter requires an operator at the rear of each unit. More accurate planting of seed pieces are possible with this type of planter. However, due to a slower rate of operation, less area can be planted per day making this planter less desirable than the pick type.

Cup-type planters operate automatically. They are well adapted to planting of whole seed and are used extensively in areas where whole seed is preferred for planting.

Jarvis (1978) indicates that the two most common types of planter in use in the United Kingdom at present are the cup-fed machines in which seed is picked up from the hopper by cups mounted on an endless chain or belt and carried to the planting shoe ; and the belt-fed type where seed flows from a hopper into a trough which periodically tips the seeds onto moving rubber belts extending backward to the shoe.

2.2 Effect of size and spacing on plant stands and yields

Bushnell (1930) reported that the smaller the seed pieces, the larger the number of plants obtained from a given quantity of potatoes. Seed pieces weighing 14 g or less, however, produce smaller plants than those weighing 28

g or more. There were no differences in height of primary plants arising from seed pieces of 28 g, 42 g, and 56 g. However, there were more secondary plants and they were taller from the 56 g than from the 28 g seed pieces.

Field studies conducted by Cordner (1940) indicated the plant stands from cut seeds to be generally superior to that obtained from whole tubers.

Tests were also conducted by Bishop and Wright (1959) on the effect of size and spacing of seed pieces on yield. Three sizes of seed, 28 g, 42 g, and 56 g and two spacings of 190 mm and 380 mm were chosen. Larger seed pieces and closer spacing increased total yield. Where the same quantities of seed potatoes were planted per hectare there was little difference in yields from 28 g seed pieces spaced 190 mm apart and 56 g seed pieces spaced 380 mm apart. Larger seed pieces and closer spacing also increased the yield of smooth tubers over 50 mm in diameter.

Results of studies in Maine by Wilson and Murphy (1969-70) showed the following; "(1) total yield generally was higher from 70 g seed than from 42 g seed;(2) whole, apical and basal cut seed pieces produced higher yields than midcut or regular cut seed pieces;(3) larger size seed produced a higher percentage of tubers below 112 g than did the smaller seed pieces;(4) although larger seed pieces produced more stems and tubers per hill, hill competition from the additional stems reduced the percentage of marketable size tubers; and(5) if Russet Burbank potatoes

are marketed on the basis of total yield, 70 g whole, split, apical or basal seed pieces should be planted. If sold on the basis of marketable size tubers, then there might be some advantage to planting 42 g seed. Lastly(6), midcut seed pieces appeared to be the least desirable of the six types for growing Russet Burbanks."

Iritani (1971) conducted trials on the effect on yield due to seed size and spacing. Cut seed of sizes 14 g, 28 g, 42 g, and 56 g, whole seed of 56 g and assorted seed containing 14 % 14 g, 62 % 28 g, and 24 % 42 g were used at spacings of 150 mm, 230 mm, and 300 mm. As size of seed piece increased the average number of stems also increased. Seed size affected not only stem numbers but also percent stand with smaller seed giving considerably poorer stands. The assorted size which averaged 34 g behaved quite similar to the 28 g seed with respect to stem numbers and percent stand. Larger seed produced significantly higher yields, however, the assorted size did not yield as well as 28 g seed . Yield of 56 g whole seed was not quite as high as 56 g cut seed. Regardless of spacing, yield increased as seed size increased. The highest yield was obtained with 56 g seed spaced 150 mm apart. This same size seed yielded almost as well at 300 mm spacing. With regard to yield response potato plants made some adjustments for spacing but not for seed size.

The larger seed spaced wider apart had less numbers of stems than smaller seed spaced closer together but still

gave higher yields. " If increased numbers of stems are obtained by increasing seed size then higher yields would result, however, if increased stem numbers are obtained by smaller seed placed closer together then higher stem numbers do not result in higher yield. "

Smith (1977) indicates that in general, the number of tubers increases with increase in the seed size. Therefore, large seeds are usually advantageous for the production of seed potatoes. The best size of seed piece to use also depended somewhat on the distance between seeds in the row. Where fertility level was high and there was enough moisture in the soil, greatest returns per hectare from 230 mm spacing were from seed pieces about 56 g in weight. According to Smith (1977) " the size of seed piece is closely linked with rate of planting of seed. The most economical size of seed piece to plant will vary with the distance of planting between seed pieces. In early days, distances between seed pieces were usually 400-500 mm and large seed pieces proved economical. In modern planting, with distances of 125-300 mm, large seed pieces have not been so decidedly superior. In many cases the large seed pieces have resulted in higher yields, but the difference often has been sufficient only to compensate for the additional seed required. As a practical recommendation, seed pieces of about 56 gm in many areas and with a large number of varieties is most economical. "

Studies have also been conducted by Andrew (1968) on

plant stands. The percentage plant stands obtained in 1967 in the Edmonton area on the basis of counts made on ten farms ranged from 37 % to 76 % with an average of 59 %, and in the Lacombe area on the basis of six farms the average stand was 87 %. In 1968 the average plant stands were 69 % in Edmonton and 88 % in southern Alberta. Further studies by Andrew and Preston (1969) indicated stands of 75 % in Edmonton, 90 % in Lacombe, and 82 % in southern Alberta. The two major factors observed for reducing stands in Alberta potato fields were, seed piece missing entirely or seed piece incorrectly spaced and the average contribution of these factors was 83.6 %, 80.2 %, and 65.1 % in the three different areas surveyed .

The reduction in yield due to missing plants was investigated (Andrew et al. 1971) by creating simulated gaps. For a 50 % plant stand the reduction in yield was from 4 % for one missing plant to 39 % for a gap of six missing plants.

Stone (1972) conducted a survey of fields in Manitoba in 1969 and observed that in 70 to 85 % of the cases where plants were missing the cause was missing seed pieces. The majority of the remaining misses were the result of poor placement of seed because of " doubles or triples ".

A survey conducted by James et al.(1973) in New Brunswick in 1972 showed that approximately 25 % of the plants were missing at emergence causing around 8 % loss in tuber yield. Further investigation by James et al.(1975)

using aerial photography for estimating misses in potato crops revealed that the percentage of missing plants ranged from 15 to 49 with an average of 32 % misses. Some of these fields were ground surveyed to find out the cause for the misses. They found out that for 88 % of the misses, no seed piece was present and in another 7 % the seed piece had rolled near the adjacent seed piece thus giving rise to a miss. The remaining 5 % misses were attributed to various factors such as diseased seed pieces, blind seed pieces, physically damaged seed pieces etc.

However, yields compared by Pascal et al.(1977) for irregularly and regularly spaced tubers had different results. The irregular spacing of tubers had no significant effect on depressing potato yield compared with that from regular spacing whether large or small seed and whether wide or close mean spacings were used to make this comparison.

Studies were conducted by Andrew and Domier (1979) to observe the effect of shape of seed pieces (tuber portions) on the potato yield. The seed pieces were grouped as apical (bud end), center, distal (stem end), longitudinal, three cut surfaces, miscellaneous, and slivers. In the case of Netted Gem seed pieces, center cut seed pieces produced the maximum yield while in case of Norland, apical portions resulted in greater yields.

2.3 Past research in planter studies

Studies have been conducted in various countries to identify the problems with present day planting equipment and suggest improvements in their design to obtain better performance under varying conditions of field, machine type, and size and shape of seed pieces etc.

Postnikov (1969) suggested that if a small tuber is released first, and a large one next, then with the currently accepted rotation direction of the seed picker unit in relation to the direction of movement of the implement, the interval between the tubers increases. And vice versa, if a large tuber is released first and a small one next, the interval between the tubers is decreased.

To check the accuracy of the theoretical calculations, field tests were done with a converted SN-4B potato planter, the design of the latter allowing for a change in the rotation direction of the seed picker unit. For this purpose, the drive was complimented with a counter-drive, and the hopper with the feeder-cup was turned 180 degrees and secured to a special frame. The intervals between the tubers were measured. The uniformity coefficient was 72-78 % and not less than 80 % of the intervals stayed within the limits of the theoretical intervals between the tubers by more than plus or minus 50 mm. In the case of the potato planter with the regular rotation direction the uniformity coefficient achieved was only 46-50 %.

Townsend (1972) conducted field trials for comparing

cup type and pick type potato planters. The machines used for the trials were (1) an Underhaug and (2) an Omme, of Danish and Norweign manufacture respectively. Both of these machines were cup type. The third machine was a pick type IHC planter of American manufacture. The planters were run at three different speeds. Whole seed pieces of cultivars Norland and Netted Gem were used for testing all three machines.

The results indicated that there were very few doubles. The Omme machine had no doubles at all but had the highest skip percent . The Underhaug machine generally had increasing spacing error and skip percentage with increasing speed with both cultivars.

On the average the pick type machine performed better than the cup type machines. The pick type machine was able to place whole Netted Gem better than whole Norlands while the cup type planters were better adapted to the Norlands.

Results from trials (Jarvis and Palmer, 1973) in which different types of planters were compared indicated that irregular seed spacing reduced yield and this has been confirmed by further experiments in which typical seed distribution patterns were reproduced by hand-planting (Jarvis et al., 1976). Results indicated that both total and marketable yields tended to fall as irregularity of spacing increased ; an average depression in marketable yield of 1.7 t/ha from planting at a coefficient of variation of 60 % compared with uniform spacing along the row was recorded.

Close grading of the seed normally improves the regularity of spacing obtained with belt-fed planters because it helps to ensure uniform loading of the belts. This adds further emphasis for using closely-graded seed in most types of automatic planters.

Trials conducted by Klassen (1975) compared the yields of manual and machine planted potatoes for the same intended spacing. Both total yield and marketable yield from the manually planted potatoes was much more than obtained with the planter.

Tests have also been conducted by the Swedish National Machinery Testing Institute (1978) for the Underhaug 1478 cup type planter. The number of doubles observed were very few but the coefficient of variation was quite large. A speed of 8.5 km/h resulted in a large number of misses. Trials with another cup type planter EHO 480 Kombi also resulted in larger seed spacing than selected especially at higher field speeds.

Jarvis (1978) suggests that "certain types of planters, particularly those based on the flat belt system, distribute the seeds much less uniformly along the row than others. A reasonably good measure of uniformity may be obtained by calculating the coefficient of variation for inter-seed spacing ; typical values are 15-25 % for cup-fed, 20-30 % for hand-fed and 40-60 % for belt fed planters. "

Studies were also done by Misener (1979) for evaluation of cup type and pick type potato planters. In general, the

pick type planter was more effective than the cup type planter. The coefficient of variation of spacing for the cup and pick type planters ranged from 59.2 % to 87.1 % and from 55.3 % to 68.7 % respectively. Both types of planters produced large number of doubles. For 30.5 metres of row length the number of doubles ranged from 5 to 65 for the cup type and from 5 to 52 for the pick type and the range of skips for the cup planter was 3 to 22 and for the pick type planter, from 3 to 19.

Laboratory studies by Hyde et al. (1979) on a pick type planter suggested that ground speed had no effect below 5 Km/h. However, when the speed was increased from 5 to 8 Km/h there was an increase in average seed piece spacing. An increase of seed level in the picker bowl decreased the average seed piece spacing. The effect on spacing due to the pick arrangement on the picker wheel was quite appreciable. Further studies by Hyde and Thornton (1980) on an Acme cup type planter observed that more seed available in the cup reservoir resulted in more seed delivered. Also the seed delivery tended to decrease as ground speed increased from 3 to 9 Km/h, probably because of increased chain agitation.

These studies indicate that the performance of potato planting equipment can have a significant influence on plant stands and yields. Therefore, the effects of size and/or shape of seed pieces on planter seed distribution patterns under various operating conditions were selected for this study.

3. EXPERIMENTAL PROCEDURE

3.1 Variables selected for study.

The effect of the following variables was studied in relation to the seed distribution pattern.

1. Planter types
   (a) Pick type
   (b) Cup type
2. Spacing
   (a1) 350 mm (a2) 460 mm (for pick type planter)
   (b1) 250 mm (b2) 380 mm (for cup type planter)
3. Speeds
   (a) 5 Km/h
   (b) 8 Km/h
4. Seed cultivars
   (a) Netted Gem
   (b) Norland
5. Seed shapes
   (a) End cut
   (b) Center cut
6. Seed size
   (a) 40 g
   (b) 60 g

3.2 Equipment used

3.2.1 Planters

The two planters used for testing the performance of their seed distribution pattern were:

1. McConnell Model 555- A single row pick type planter manufactured by McConnell Mfg.Co.Inc., Prattsburg, New York (Figure 3.1). The tests were conducted on a new planter. In this planter, picker arms are mounted on the picker wheels. The picker arms are designed to use two or more slender sharp steel picks depending on the size of the seed to be planted. The picks are used to pick up the seed piece at point (B) (Figure 3.2) by the strike of the pickers. The picker arm then carries the seed piece clockwise to point (A) where the picks are withdrawn from the seed and the seed falls into the seed spout. The picker arms then stay open until the picker arm reaches the point (B) at which point another seed is picked up by the picks. The seed is not flipped off the picks, but falls naturally when the cam withdraws the pick from the seed.

   The accuracy with which the planter operates depends upon the proper adjustment of the picks in the picker arm. The picks may be placed in five different positions. Long picks or short picks are selected to suit the size of seed to be planted.

2. Acme Model 20- A two row cup type planter manufactured by Acme Manufacturing Co.Inc., Filer, Idaho (Figure 3.3). The tests were conducted on a used planter. In this planter, cups are mounted in a single row on an endless chain (Figure 3.4). As the chain moves, seed pieces are picked up from the picker bowl and carried by

FIGURE 3.1 PICK TYPE PLANTER

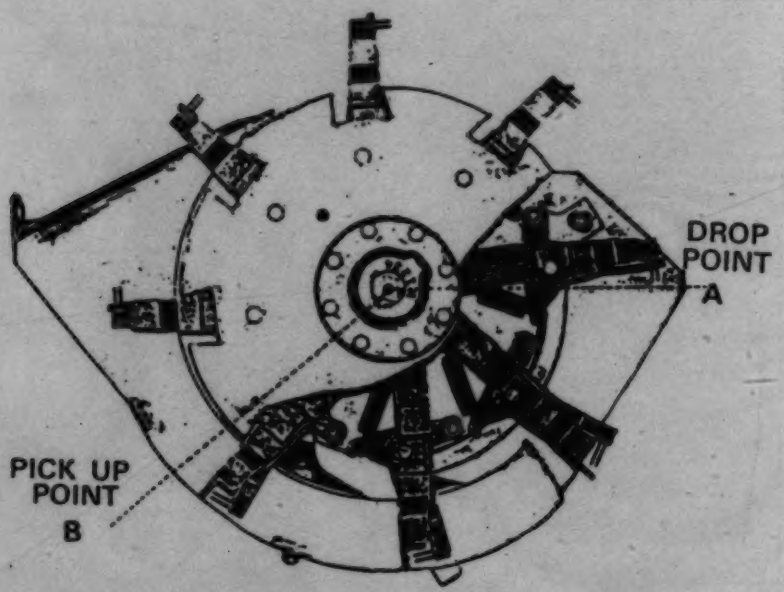

FIGURE 3.2 PICKING MECHANISM OF THE PICK TYPE PLANTER

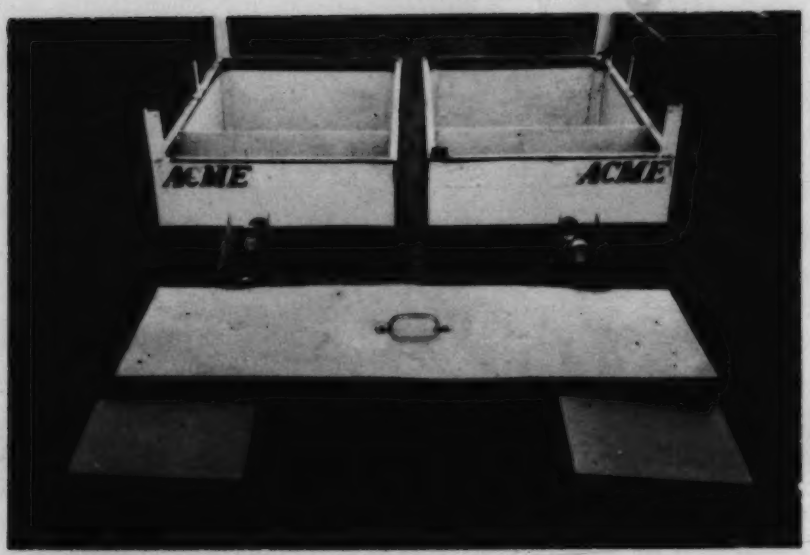

FIGURE 3.3 CUP TYPE PLANTER

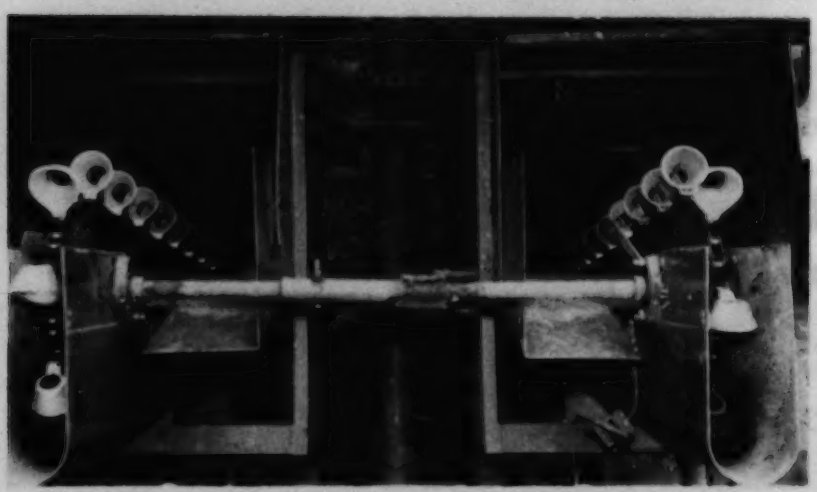

FIGURE 3.4 PICKING MECHANISM OF THE CUP TYPE PLANTER

the cups to the planter shoe for planting in the soil.

3.2.2 Power unit

The planters were operated with a Massey Ferguson MF 2805 tractor.

3.2.3 Measuring unit

A 50 metre long tape with a least count of 10 mm was used for measuring seed spacings between the two adjacent seed pieces.

3.2.4 Weighing unit

A weigh scale with a least count of 1 g was used for weighing seed pieces.

3.3 Preparation of seed

Seed pieces of two cultivars were used; Netted Gem and Norland. Netted Gem tubers are oblong in shape with netted skin and shallow eyes. These are widely grown in Alberta. Norland tubers are oblong with smooth reddish skin and shallow eyes. Cut seed pieces were used for all the trials. All the seed pieces were hand cut to obtain uniform size seed pieces. The seed pieces were cut in the sizes of 40 g and 60 g. All the seed pieces were weighed and only those seed pieces which were within 5 % of the desired weight were used for the trials. No seed treatment was used.

Two shapes of seeds were used, i.e. end pieces and center cut. End pieces were not differentiated as apical

(bud end) or distal (stem end), as they were the same shape and were considered to have the same influence on the planter's performance.

3.4 Field test procedure

The field trials were conducted at the Agricultural Engineering Research Station of the University of Alberta at Ellerslie. A field plot of 80 metres length and 30 metres width was selected for conducting the trials.

In all, 64 trials were completed. There were 5 replicates for each trial. Data for each trial were collected over row lengths of 50 metres. To facilitate measurement of seed pieces spacings, the seed covering devices from the planters were removed. The trials were repeated on the same plot and the land was cultivated and harrowed before each trial.

Due to the large capacity of the Acme cup type planter, a partition was made in the seed hopper to reduce its capacity to one fourth (Figure 3.5). Since this planter was a two row unit, seed placement of both the rows was measured on each run but was considered only as one replicate of 100 metres length.

In the case of the pick type planter the picks were set at the picker arm in such a way that there were long picks both at the inner and the outer positions of the picker wheel and to maintain uniformity, the same position was maintained for all the trials (Figure 3.6).

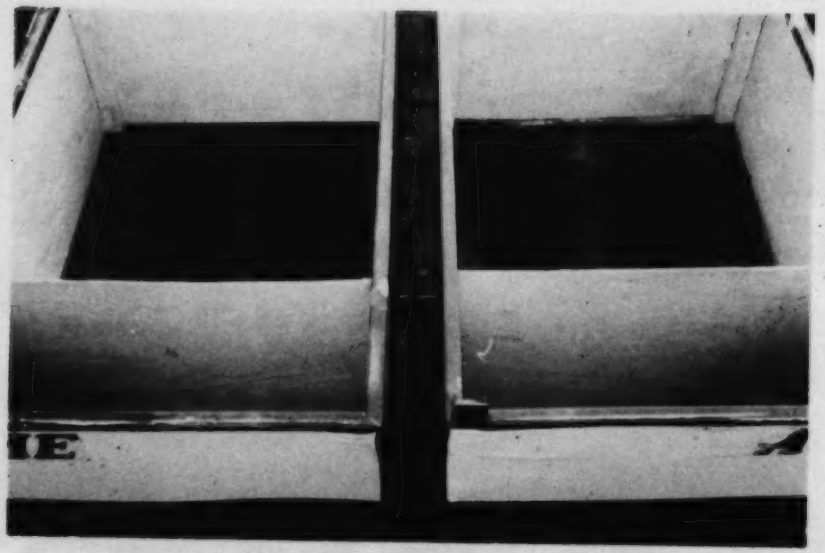

FIGURE 3.5 SEED HOPPER OF THE CUP TYPE PLANTER SHOWING PARTITION FOR REDUCED CAPACITY

FIGURE 3.6 A VIEW OF THE POSITION OF PICKS AT THE PICKER ARMS

The space setting of the pick type planter was set at 350 mm and that of cup type planter at 380 mm. After all the trials at these settings were over, the space setting of the pick type planter was changed to 460 mm and that of the cup type to 250 mm. The same space settings could not be used on both the planters because of different gear combinations available for the planters. The trials were conducted at speeds of both 5 km/h and 8 km/h.

For each trial, the seed hopper was filled with cut seed of a particular cultivar, size and shape. The planter was pulled with the tractor operating at a selected speed. Seed pieces were dropped over a length of 60 metres and at a depth of about 50 to 75 mm. After the completion of a run the tractor was stopped and the measuring tape was laid on the furrow to measure the position of seed pieces over a length of 50 metres after leaving a space of 5 metres at both the ends to compensate for the variation in speed at the beginning and at the end of a run (Figure 3.7). The center to center distances between two adjacent seed pieces were recorded to an accuracy of 10 mm. After measurements, the seed pieces were picked up, hand cleaned, and used again for the replication of the trial. However, fresh seed pieces were used for each trial.

The data obtained were stored in the University of Alberta computer for subsequent classification and analysis.

FIGURE 3.7 MEASUREMENT OF SEED PLACEMENT

4. RESULTS AND DISCUSSION

A typical example of placement of seed pieces by the pick type planter is shown in Figure 4.1 . Three seed pieces have dropped at the same spot due to sticking of the seed pieces with one another. Figure 4.2 shows another example of sticking of seed pieces in the hopper. On the left hand side the seed pieces are stuck in the hopper causing a bridging action and thus resulting in large gaps in seed placement. Figure 4.3 shows an example of center cut seed pieces placement by the cup type planter. Both missing seed pieces and groups of seed pieces can be observed. Figure 4.4 shows an example of more than one seed piece being picked up in some of the cups.

4.1 Seed spacing classification

To determine the uniformity of seed placement the spacings were classified in four catagories as singles, doubles, misses and double misses. If the distance between two adjacent seed pieces was less than half of the space setting, it was defined as a double. A distance between half and one and a half the space setting was termed as a single, between one and one-half and twice as a miss and greater than twice as a double miss.

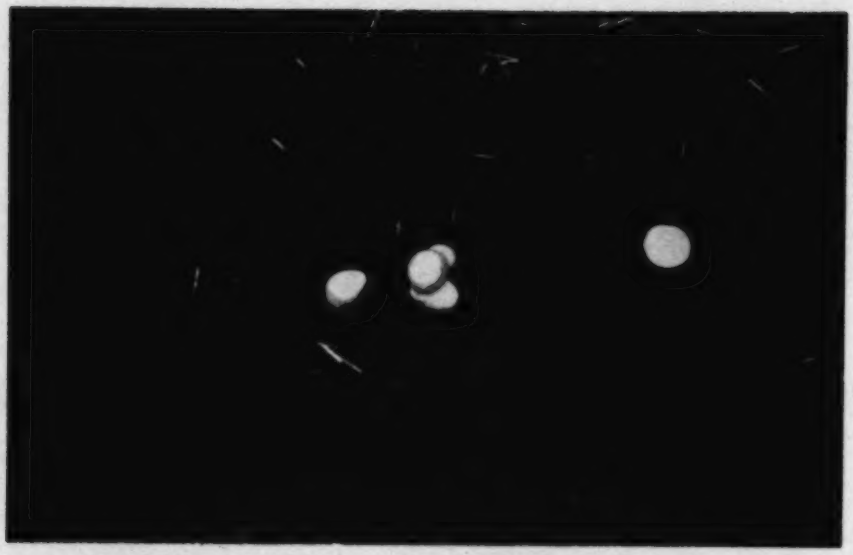

FIGURE 4.1 A VIEW OF SEED PLACEMENT BY THE PICK TYPE PLANTER

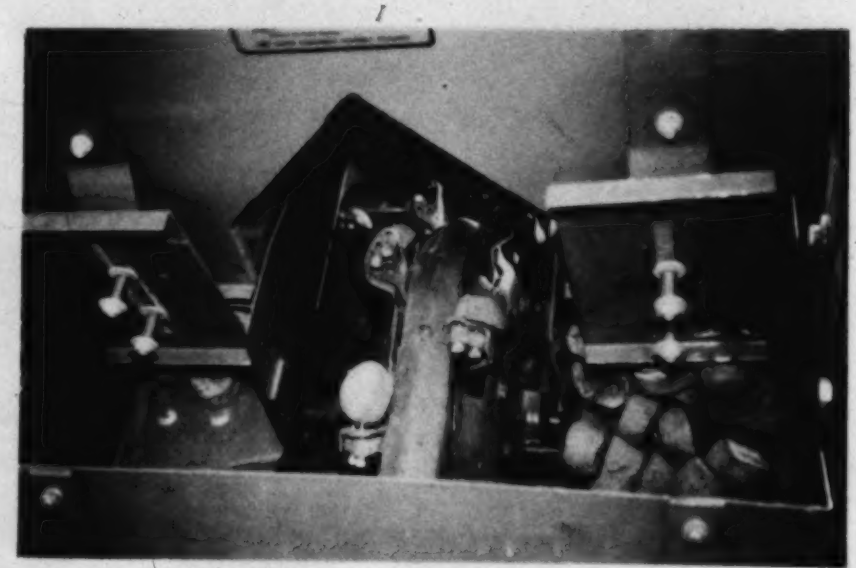

FIGURE 4.2 A VIEW OF BRIDGING ACTION IN THE PICK TYPE PLANTER

FIGURE 4.3 A VIEW OF SEED PLACEMENT
BY THE CUP TYPE PLANTER

FIGURE 4.4 A VIEW OF SEEDS PICKED UP
BY THE CUP TYPE PLANTER

4.2 Analysis

The data were analysed as a 4x2x2x2x2 factorial experiment with 5 replications. Two different space settings were used for both pick type and cup type planters. Therefore, a planter with two different space settings was, for the purpose of statistical analysis, considered as two different planters. Thus the data were analysed as if 4 different planters were tested. The data used for the analysis of variance were the percentages of single spaced seed pieces in each trial.

The percentage of singles obtained by the pick type planter at 350 mm space settings are shown in Table 4.1. The total percentage of singles were obtained by adding seed spacings of all the replicates. The highest percentage of singles obtained at this space setting was 76.5 % with end cut Netted Gem seed pieces weighing 40 g and at a planter operating speed of 5 km/h. The lowest percentage of singles obtained was 33.1 % with center cut Norland seed pieces weighing 60 g and at a planter operating speed of 5 km/h. Under similar conditions, end cut seed pieces always produced a higher percentage of singles than center cut seed pieces.

The percentage of singles obtained by the pick type planter at 460 mm space setting are shown in Table 4.2. The highest percentage of singles obtained at this space setting was 80.0 % with end cut Netted Gem seed pieces weighing 60 g

TABLE 4.1

PERCENTAGE OF SINGLES DROPPED BY THE PICK TYPE PLANTER AT 350 mm SPACE SETTING

REP 1	REP 2	REP 3	REP 4	REP 5	TOTAL	
63.6	52.5	66.0	54.9	61.0	59.8	B1 C1 D1 E1
39.2	45.9	40.9	47.7	49.6	45.1	B1 C1 D1 E2
33.0	59.9	79.3	70.7	68.6	63.9	B1 C1 D2 E1
31.6	19.0	17.6	48.0	38.6	33.1	B1 C1 D2 E2
76.0	77.4	79.5	71.7	77.1	76.5	B1 C2 D1 E1
52.9	59.8	51.7	41.7	52.9	52.7	B1 C2 D1 E2
49.0	69.6	69.9	33.3	45.5	55.6	B1 C2 D2 E1
50.5	41.2	40.4	65.6	50.9	51.2	B1 C2 D2 E2
63.1	63.7	68.8	68.8	61.3	65.2	B2 C1 D1 E1
47.7	42.9	53.2	60.0	58.5	52.7	B2 C1 D1 E2
58.5	45.7	66.7	87.4	78.6	68.6	B2 C1 D2 E1
49.6	51.2	47.0	51.4	47.9	49.5	B2 C1 D2 E2
72.8	75.0	76.4	73.4	74.3	74.4	B2 C2 D1 E1
49.0	39.4	57.4	49.5	21.7	45.0	B2 C2 D1 E2
62.7	63.2	56.3	59.7	58.9	60.1	B2 C2 D2 E1
54.9	20.0	37.8	52.6	46.7	45.1	B2 C2 D2 E2

SPEEDS	B1- 5 km/h,	B2- 8 km/h
CULTIVARS	C1- NORLAND,	C2- NETTED GEM
SIZES	D1- 40 g,	D2- 60 g
SHAPES	E1- END PIECES,	E2- CENTER CUT

TABLE 4.2

PERCENTAGE OF SINGLES DROPPED BY THE PICK TYPE PLANTER AT 460 mm SPACE SETTING

REP 1	REP 2	REP 3	REP 4	REP 5	TOTAL	
65.4	67.7	69.0	71.2	74.3	69.3	B1 C1 D1 E1
54.4	59.5	59.8	59.0	62.4	59.0	B1 C1 D1 E2
75.8	73.7	72.6	68.5	67.3	71.7	B1 C1 D2 E1
56.8	47.8	62.0	56.7	51.5	55.2	B1 C1 D2 E2
63.4	59.2	63.1	66.7	65.2	63.5	B1 C2 D1 E1
43.7	52.0	53.6	53.2	47.4	49.8	B1 C2 D1 E2
75.0	70.4	77.1	78.9	71.7	74.6	B1 C2 D2 E1
56.6	39.1	58.4	57.0	56.5	54.2	B1 C2 D2 E2
67.7	55.4	61.5	67.3	66.1	63.4	B2 C1 D1 E1
64.0	54.4	65.0	70.2	67.3	63.8	B2 C1 D1 E2
67.2	77.5	75.0	73.2	78.1	74.2	B2 C1 D2 E1
39.1	53.3	52.1	51.1	52.9	50.5	B2 C1 D2 E2
50.4	59.8	60.4	60.3	61.6	58.5	B2 C2 D1 E1
59.4	40.2	59.8	51.9	48.1	51.8	B2 C2 D1 E2
79.3	82.5	81.9	74.8	81.5	80.0	B2 C2 D2 E1
60.5	64.7	69.9	68.1	65.5	65.6	B2 C2 D2 E2

SPEEDS	B1- 5 km/h,	B2- 8 km/h
CULTIVARS	C1- NORLAND,	C2- NETTED GEM
SIZES	D1- 40 g,	D2- 60 g
SHAPES	E1- END PIECES,	E2- CENTER CUT

and at a planter operating speed of 8 km/h. The lowest percentage of singles obtained was 49.8 % with center cut Netted Gem seed pieces weighing 40 g and at a planter operating speed of 5 km/h. Under similar conditions, end cut seed pieces produced a higher percentage of singles than center cut seed pieces, except at a planter speed of 8 km/h with 40 g Norland seed pieces, when center cut seed pieces produced a slightly higher percentage of singles than end cut seed pieces.

The overall average percentage of singles obtained by the pick type planter for the end pieces was 67.4 % and for the center cut seed pieces was 51.5 %. The reason for the higher percentage of singles with the end pieces could be the round shape which reduces the area of contact of seed pieces to one another and to the hopper. Center cut seed pieces on the other hand, have flat surfaces and thus an increased chance of sticking which could result in more doubles and misses.

The percentage of singles obtained by the cup type planter at 250 mm space setting are shown in Table 4.3. The highest percentage of singles obtained at this space setting was 61.1 % with end cut Netted Gem seed pieces weighing 60 g and at a planter operating speed of 5 km/h. The lowest percentage of singles obtained was 28.2 % with center cut Norland seed pieces weighing 60 g and at a planter operating speed of 8 km/h. Under similar conditions, end cut seed pieces produced a higher percentage of singles than the

TABLE 4.3

PERCENTAGE OF SINGLES DROPPED BY THE CUP TYPE PLANTER AT 250 mm SPACE SETTING

REP 1	REP 2	REP 3	REP 4	REP 5	TOTAL	
53.7	51.8	53.4	61.6	60.1	56.2	B1 C1 D1 E1
41.7	41.1	47.3	58.9	52.3	47.9	B1 C1 D1 E2
44.2	50.7	46.0	45.6	53.2	47.9	B1 C1 D2 E1
33.0	35.4	36.3	36.7	39.4	36.3	B1 C1 D2 E2
49.4	54.3	61.6	60.5	58.4	57.0	B1 C2 D1 E1
34.0	37.4	35.8	42.9	40.6	38.1	B1 C2 D1 E2
54.2	59.6	52.5	67.7	69.3	61.1	B1 C2 D2 E1
45.3	46.9	45.5	41.7	43.0	44.6	B1 C2 D2 E2
47.6	41.6	43.7	49.5	49.4	46.4	B2 C1 D1 E1
40.9	43.9	46.4	50.5	46.9	45.6	B2 C1 D1 E2
37.6	31.1	39.1	34.3	36.1	35.6	B2 C1 D2 E1
27.7	21.9	33.3	29.6	27.9	28.2	B2 C1 D2 E2
43.0	36.9	45.0	47.5	45.9	43.8	B2 C2 D1 E1
34.5	27.0	28.8	35.4	37.0	32.6	B2 C2 D1 E2
33.6	34.4	53.5	48.1	43.3	42.9	B2 C2 D2 E1
35.5	25.4	24.2	30.3	35.3	30.2	B2 C2 D2 E2

SPEEDS	B1- 5 km/h,	B2- 8 km/h
CULTIVARS	C1- NORLAND,	C2- NETTED GEM
SIZES	D1- 40 g,	D2- 60 g
SHAPES	E1- END PIECES,	E2- CENTER CUT

center cut seed pieces.

The percentage of singles obtained by the cup type planter at 380 mm space setting are shown in Table 4.4. The highest percentage of singles obtained at this space setting was 65.2 % with end cut Netted Gem seed pieces weighing 40 g and at a planter operating speed of 5 km/h. The lowest percentage of singles obtained was 26.8 % with center cut Netted Gem seed pieces weighing 40 g and at a planter operating speed of 8 km/h. Under similar conditions, end cut seed pieces produced a higher percentage of singles than the center cut seed pieces.

The overall average percentage of singles obtained by the cup type planter for the end pieces was 52.2 % and for the center cut seed pieces was 36.1 %. With the cup type planter as well as the pick type, the higher percentage of singles for the end cut pieces suggest that increased number of end cut pieces would result in a better seed distribution pattern.

The statistical analysis of data is shown in Table 4.5. There was no significant difference found among planter-spacing combinations. An average of 56.1 % and 62.8 % singles were obtained by the pick type planter at 350 mm and 460 mm spacings respectively and 43.4 % and 44.8 % singles were obtained by the cup type planter at 250 mm and 380 mm spacings respectively.

There was no significant difference between the two speeds selected for operating the planters. An average of

TABLE 4.4

PERCENTAGE OF SINGLES DROPPED BY THE CUP TYPE PLANTER AT 380 mm SPACE SETTING

REP 1	REP 2	REP 3	REP 4	REP 5	TOTAL				
49.8	59.2	53.3	51.2	58.1	54.9	B1	C1	D1	E1
35.4	28.2	31.8	37.1	37.6	34.4	B1	C1	D1	E2
64.5	62.6	62.7	63.4	66.3	64.0	B1	C1	D2	E1
34.7	37.9	52.4	58.5	53.2	48.3	B1	C1	D2	E2
64.4	64.8	65.2	65.9	65.6	65.2	B1	C2	D1	E1
29.8	35.8	28.1	29.6	29.9	30.7	B1	C2	D1	E2
68.9	64.7	60.5	60.6	67.9	64.5	B1	C2	D2	E1
28.6	32.0	32.1	40.9	40.5	35.4	B1	C2	D2	E2
48.7	47.5	47.5	53.2	59.9	51.3	B2	C1	D1	E1
39.2	32.2	31.1	29.0	33.0	33.2	B2	C1	D1	E2
45.4	36.3	35.1	48.0	44.9	42.0	B2	C1	D2	E1
30.9	36.4	36.0	37.7	40.5	36.5	B2	C1	D2	E2
53.5	48.9	56.8	55.7	59.6	55.0	B2	C2	D1	E1
30.6	33.9	24.4	25.3	21.4	26.8	B2	C2	D1	E2
47.9	47.3	46.6	51.0	44.9	47.6	B2	C2	D2	E1
24.5	26.5	36.8	23.2	30.5	28.4	B2	C2	D2	E2

SPEEDS B1- 5 km/h, B2- 8 km/h

CULTIVARS C1- NORLAND, C2- NETTED GEM

SIZES D1- 40 g, D2- 60 g

SHAPES E1- END PIECES, E2- CENTER CUT

TABLE 4.5

ANALYSIS OF VARIANCE (5 %)

SOURCE	DEG. OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABLE VALUE
A	3	20335.516	6778.505	6.72	9.28
B	1	1149.128	1149.128	1.14	10.13
C	1	3.240	3.240	0.02	5.99
D	1	99.012	99.012	0.59	5.99
E	1	21043.828	21043.828	125.74 *	5.99
AB	3	3026.439	1008.813	6.03 *	4.76
AC	3	176.575	58.858	0.35	4.76
AD	3	1967.032	655.677	3.92	4.76
AE	3	1505.085	501.695	2.99	4.76
BC	1	185.440	185.440	1.11	5.99
BD	1	36.315	36.315	0.22	5.99
BE	1	328.860	328.860	1.96	5.99
CD	1	312.840	312.840	1.87	5.99
CE	1	570.846	570.846	3.41	5.99
DE	1	14.792	14.792	0.09	5.99
ABC	3	737.469	245.823	1.47	4.76
ABD	3	812.376	270.792	1.62	4.76
ABE	3	211.043	70.347	0.42	4.76
ACD	3	1990.319	663.439	3.96	4.76
ACE	3	518.694	172.898	1.03	4.76

ADE	3	1014.760	338.253	2.02	4.76
BCD	1	100.128	100.128	0.60	5.99
BCE	1	35.112	35.112	0.21	5.99
BDE	1	7.140	7.140	0.04	5.99
CDE	1	507.024	507.024	3.03	5.99
ABCD	3	184.651	61.550	1.39	2.60
ABCE	3	413.209	137.736	3.12 *	2.60
ABDE	3	175.724	58.574	1.32	2.60
BCDE	1	2.850	2.850	0.06	3.84
ACDE	3	590.964	196.988	4.46 *	2.60
ABCDE	3	227.085	75.695	1.71	2.60
ERROR	256	11315.232	44.200		
TOTAL	319	69598.738			

*-SIGNIFICANT

A-PLANTERS-SPACINGS B-SPEEDS C-CULTIVARS
D-SIZES E-SHAPES

53.8 % singles were obtained at the speed of 5 km/h and 49.8 % at the speed of 8 km/h. The speed range selected for this experiment was not wide enough to influence the performance of these planters.

There was no significant difference between the two cultivars. An average of 51.7 % and 51.9 % single spaced seed pieces were obtained for Norland and Netted Gem respectively.

There was no significant difference between the two sizes of seed pieces. An average of 52.2 % and 51.4 % single spaced seed pieces were obtained for 40 g and 60 g size seed pieces. The data from this experiment suggest that both 40 g and 60 g seed pieces would result in the same accuracy of seed placement.

The effect of shapes of seeds was found highly significant. An average of 59.8 % singles was obtained with end cut seed pieces and 43.8 % with center cut seed pieces. The better seed distribution pattern of the end cut seed pieces leads to the conclusion of using tubers weighing approximately 120 to 150 g which could be either cut into two end pieces or two end pieces and a center cut for obtaining the maximum number of seed pieces of the desired shape.

A significant difference was also observed in the interactions between planter-spacing combinations and speeds. The results are given in Table 4.6. With the pick type planter, an increase in speed from 5 km/h to 8 km/h

TABLE 4.6

PERCENTAGE OF SINGLES FOR PLANTER-SPACING COMBINATIONS AT 5 km/h AND 8 km/h

PLANTER/SPACING	SPEEDS		DIFF.
	5 km/h	8 km/h	
PICK TYPE			
350 mm	54.7	57.6	+ 2.9
460 mm	62.1	63.5	+ 1.4
CUP TYPE			
250 mm	48.9	38.2	-10.7
380 mm	49.7	40.1	- 9.6

resulted in an increase in percentage of singles for both the spacings. For 350 mm spacing the single spaced seed pieces increased by 2.9 % and for 460 mm spacing the increase was 1.4 %. In the case of the cup type planter, an increase in speed from 5 km/h to 8 km/h resulted in a decrease in percentage of singles for both the spacings. For the 250 mm spacing the single spaced seed pieces decreased by 10.7 % and for 380 mm spacing the decrease was 9.6 %. The pick type planter seemed to perform slightly better at the higher speed, due perhaps to the greater force developed by the picks as the seed pieces were picked up and thus causing fewer skips. The cup type planter however, resulted in poor performance at the increased speeds perhaps due to the increased chain agitation and thus bouncing of the seed pieces off the cups.

Mean spacings obtained are shown in Table 4.7. For the cup type planter at 380 mm space setting, a mean spacing as high as 902.2 mm was obtained for 60 g center cut Netted gem seed pieces at planter speed of 8 km/h. Mean spacings increased at the higher speed with the cup type planter at both the space settings but no such trend was observed with the pick type planter. Tests conducted by the Swedish National Machinery Testing Institute (1978) on the EHO 480 Kombi planter also resulted in increased mean spacings at higher speeds for unsprouted seed potatoes. However, any inference on the basis of mean spacings can be quite misleading because seed pieces classified as doubles and

TABLE 4.7

MEAN SPACINGS (mm) OBTAINED FOR DIFFERENT OPERATING CONDITIONS

	PICK TYPE		CUP TYPE		
SETTING	350 mm	460 mm	250 mm	380 mm	
	410.7	415.4	278.0	329.0	E1 D1 C1 B1
	467.4	456.2	329.4	430.2	E2 D1 C1 B1
	409.3	436.7	350.0	442.3	E1 D2 C1 B1
	639.0	470.3	478.6	523.6	E2 D2 C1 B1
	331.6	383.7	259.5	321.3	E1 D1 C2 B1
	534.3	420.4	431.1	624.8	E2 D1 C2 B1
	418.0	443.3	353.3	425.1	E1 D2 C2 B1
	483.3	584.6	388.5	780.4	E2 D2 C2 B1
	326.4	433.3	336.1	395.8	E1 D1 C1 B2
	375.3	443.9	349.0	549.4	E2 D1 C1 B2
	383.0	433.3	421.3	529.0	E1 D2 C1 B2
	434.1	543.7	620.4	617.1	E2 D2 C1 B2
	314.7	375.1	323.8	352.2	E1 D1 C2 B2
	480.3	425.4	478.8	735.9	E2 D1 C2 B2
	355.3	435.1	433.9	505.3	E1 D2 C2 B2
	493.2	437.0	483.3	902.2	E2 D2 C2 B2

B1-5 km/h B2-8 km/h C1-NORLAND C2-NETTED GEM
D1-40 g D2-60 g E1-END PIECES E2-CENTER CUT

misses will result in the calculated mean spacing being close to the intended spacing.

The coefficients of variation obtained in this study are shown in Table 4.8. The coefficients of variation for the same operating conditions were generally lower with the pick type planter than with the cup type planter. Excluding the coefficients of variations of 102.0 % and 125.5 % which were caused due to bridging action, the average coefficient of variation for the pick type planter at 350 mm spacing was 67.2 %. At 460 mm spacing the average coefficient of variation for the pick type planter was 54.9 %.

The average coefficient of variation for the cup type planter at 250 mm spacing was 66.8 % and at 380 mm spacing was 75.0 %. Tests conducted by Misener (1979) also resulted in a lower coefficient of variation with the pick type planter than with the cup type planter.

The overall percentage of singles obtained by the pick type planter was 59.5 % and by the cup type planter was 44.2 %. Tests were also conducted by the Prairie Agricultural Machinery Institute (1978) at Portage la Prairie, Manitoba, on three different pick type planters using 40 g Netted Gem cut seed. The percentage of singles obtained for these planters was very high. With the McConnell Model 555, four row pick type planter the percentage of singles obtained was as high as 82 %. The reason for the higher percentage of singles could be linked with the wide range chosen for classifying the seed pieces as singles (for 460 mm spacing

TABLE 4.8

COEFFICIENT OF VARIATION (%) OBTAINED
FOR DIFFERENT OPERATING CONDITIONS

	PICK TYPE		CUP TYPE		
SETTING	350 mm	460 mm	250 mm	380 mm	
	60.9	48.9	60.7	70.6	E1 D1 C1 B1
	75.8	58.7	69.2	118.7	E2 D1 C1 B1
	102.0*	46.0	54.2	58.2	E1 D2 C1 B1
	74.7	62.5	82.6	96.9	E2 D2 C1 B1
	125.5*	57.1	61.5	58.8	E1 D1 C2 B1
	83.4	68.4	77.7	102.4	E2 D1 C2 B1
	57.4	45.6	40.9	54.8	E1 D2 C2 B1
	71.3	56.8	65.1	94.2	E2 D2 C2 B1
	59.8	57.0	60.4	75.0	E1 D1 C1 B2
	70.7	55.9	67.8	103.5	E2 D1 C1 B2
	53.7	45.0	62.1	78.4	E1 D2 C1 B2
	68.4	59.5	98.6	62.1	E2 D2 C1 B2
	49.7	59.3	70.9	68.5	E1 D1 C2 B2
	74.1	65.2	70.6	98.8	E2 D1 C2 B2
	58.0	38.8	58.6	67.7	E1 D2 C2 B2
	82.6	53.9	68.9	91.4	E2 D2 C2 B2

B1-5 km/h B2-8 km/h C1-NORLAND C2-NETTED GEM

D1-40 g D2-60 g E1-END PIECES E2-CENTER CUT

* - BRIDGING ACTION

the range was from 160 mm to 840 mm) and the range was even different for different planters.

On an average the double spaced seed pieces with the pick type planter were 19.8 % and with the cup type planter were 19.5 %.

On an average the seed pieces classified as misses were 12.2 % with the pick type planter and 13.4 % with the cup type planter.

The seed pieces classified as double misses were less with the pick type planter than with the cup type planter. On an average there were 8.4 % double miss seed pieces with the pick type planter and 23.0 % with the cup type planter. The higher percentage of double misses could be due to seed pieces bouncing off the cups particularly at higher speeds.

5. SUMMARY AND CONCLUSIONS

The seed distribution patterns for a pick type and a cup type planter were studied in this experiment. The seed placement for the planters was measured over a row length of 50 metres under various operating conditions. Two levels each of speeds, planter spacings, cultivars, sizes and shapes of seed pieces were varied for each planter.

5.1 Effect of seed shape

There was a significant difference in seed distribution due to the shapes of seed pieces. End cut seed pieces were found to be superior to center cut seed pieces. An average of 59.8 % singles were obtained with end cut seed pieces, while with center cut seed pieces the singles obtained were only 43.8 %.

5.2 Effect of speed

With the pick type planter the percentage of singles increased slightly with an increase of planter speed from 5 km/h to 8 km/h. The increase in percentage of singles was 2.9 for 350 mm spacing and 1.4 for the 460 mm spacing.

With the cup type planter, an increase in speed from 5 km/h to 8 km/h resulted in a marked decrease in percentage of singles. The decrease in percentage of singles was 10.7 for 250 mm spacing and 9.6 for 380 mm spacing.

5.3 Type of planter

An average of 59.5 % singles were obtained with the pick type planter and 44.2 % singles with the cup type planter. As the spacings were not the same for each planter the difference of 15.3 % can not be considered significant.

5.4 Effect of cultivars and seed size

There was no significant difference observed for the two seed cultivars of Netted Gem and Norland and also for the seed sizes of 40 g and 60 g.

5.5 Coefficient of variation

The overall average coefficient of variation (excluding those due to bridging action) for the pick type planter was 61.0 % and for the cup type planter was 70.9 %.

5.6 Conclusions

Based on the results of this study, the following conclusions can be drawn:

1. The end cut seed pieces were superior to the center cut seed pieces.
2. The pick type planter performed better at higher speeds and the cup type planter at slower speeds.
3. The pick type planter appeared to have a better seed distribution pattern than the cup type planter.

4. There was no effect of the cultivars on the performance of the planters.
5. There was no effect of the seed size on the performance of the planters.

6. RECOMMENDATIONS FOR FURTHER WORK

Further research in the following areas may be informative to potato growers:

1. Pick type planters appear to have a better seed distribution pattern but picks are the main source for causing physical damage to the seed pieces and spreading diseases. The extent to which loss is incurred due to damage to the seed pieces and diseased seed pieces should be determined in relation to the advantage gained by a better distribution pattern. An idea may be considered of passing the picks through a source of disinfectant after the seed has been dropped and before the next one is picked up.
2. End cut seed pieces have shown superiority over center cut seed pieces. Further studies could be done regarding the chances of a sufficient number of eyes appearing on the seed pieces and the chances of their germination.
3. At present there is no standard procedure for testing and rating potato planting machinery. Different norms are being adopted by different testing agencies. Specific standards should be laid out by agencies like the Canadian Society of Agricultural Engineering or the American Society of Agricultural Engineers, not only for testing planting equipment but also for defining catagories for seed classification.
4. At increased planter speeds there is an increase in rolling of seed pieces. The extent of seed piece roll

could be further investigated.

5. Since mechanical cutters are commonly used for obtaining cut seed pieces, the performance of cutters in relation to uniformity in size and shape of seed pieces should be investigated.
6. Recently some plate type planters have been introduced in the market. A study of their performance in relation to the existing types of planters would be of advantage to potato growers.
7. Further trials with pick and cup type planters for the same space settings should be conducted.
8. Additional agronomic studies should be carried out to provide more information on the reduction and the possible compensation in potato yields due to gaps and doubles.

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APPENDIX-A

RESULTS OF THE PICK TYPE PLANTER

	Page		Page
A1 B1 C1 D1 E1	54	A2 B1 C1 D1 E1	70
A1 B1 C1 D1 E2	55	A2 B1 C1 D1 E2	71
A1 B1 C1 D2 E1	56	A2 B1 C1 D2 E1	72
A1 B1 C1 D2 E2	57	A2 B1 C1 D2 E2	73
A1 B1 C2 D1 E1	58	A2 B1 C2 D1 E1	74
A1 B1 C2 D1 E2	59	A2 B1 C2 D1 E2	75
A1 B1 C2 D2 E1	60	A2 B1 C2 D2 E1	76
A1 B1 C2 D2 E2	61	A2 B1 C2 D2 E2	77
A1 B2 C1 D1 E1	62	A2 B2 C1 D1 E1	78
A1 B2 C1 D1 E2	63	A2 B2 C1 D1 E2	79
A1 B2 C1 D2 E1	64	A2 B2 C1 D2 E1	80
A1 B2 C1 D2 E2	65	A2 B2 C1 D2 E2	81
A1 B2 C2 D1 E1	66	A2 B2 C2 D1 E1	82
A1 B2 C2 D1 E2	67	A2 B2 C2 D1 E2	83
A1 B2 C2 D2 E1	68	A2 B2 C2 D2 E1	84
A1 B2 C2 D2 E2	69	A2 B2 C2 D2 E2	85

SPACINGS	A1- 350 mm,	A2- 460 mm
SPEEDS	B1- 5 km/h,	B2- 8 km/h
CULTIVARS	C1- NORLAND,	C2- NETTED GEM
SIZES	D1- 40 g,	D2- 60 g
SHAPES	E1- END PIECES,	E2- CENTER CUT

TABLE A-1 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	6	5.6	5	4.7	15	14.0	28	26.2	17	15.9	10	9.3	26	24.3
REP 2	13	10.8	15	12.5	13	10.8	24	20.0	19	15.8	9	7.5	27	22.5
REP 3	10	7.1	23	16.3	24	17.0	39	27.7	24	17.0	8	5.7	13	9.2
REP 4	13	11.5	8	7.1	15	13.3	26	23.0	16	14.2	7	6.2	28	24.8
REP 5	9	7.6	12	10.2	23	19.5	28	23.7	11	9.3	8	6.8	27	22.9
TOTAL	51	8.5	63	10.5	90	15.0	145	24.2	87	14.5	42	7.0	121	20.2

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	68	63.6	63	52.5	93	66.0	62	54.9	72	61.0	358	59.8
DOUBLES(0-170)	10	9.3	23	19.2	29	20.6	17	15.0	15	12.7	94	15.7
MISSES(540-700)	14	13.1	16	13.3	11	7.8	20	17.7	13	11.0	74	12.4
DOUBLE MISS(>700)	15	14.0	18	15.0	8	5.7	14	12.4	18	15.3	73	12.2
MEAN SPACING(mm)	461.4		411.5		352.6		429.3		415.5		410.7	
COEF.OF VARI.(%)	57.1		60.3		60.9		62.2		61.0		60.9	

TABLE A-2 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	10	12.7	6	7.6	8	10.1	14	17.7	8	10.1	6	7.6	27	34.2
REP 2	9	8.3	13	11.9	16	14.7	18	16.5	9	8.3	14	12.8	30	27.5
REP 3	10	9.1	13	11.8	14	12.7	11	10.0	15	13.6	16	14.5	31	28.2
REP 4	11	9.9	14	12.6	12	10.8	22	19.8	12	10.8	11	9.9	29	26.1
REP 5	12	9.9	22	18.2	13	10.7	18	14.9	24	19.8	6	5.0	26	21.5
TOTAL	52	9.8	68	12.8	63	11.9	83	15.7	68	12.8	53	10.0	143	27.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	31	39.2	50	45.9	45	40.9	53	47.7	60	49.6	239	45.1
DOUBLES(0-170)	15	19.0	21	19.3	22	20.0	22	19.8	31	25.6	111	20.9
MISSES(540-700)	11	13.9	22	20.2	28	25.5	15	13.5	10	8.3	86	16.2
DOUBLE MISS(>700)	22	27.8	16	14.7	15	13.6	21	18.9	20	16.5	94	17.7
MEAN SPACING(mm)	624.2		454.9		451.5		446.8		409.6		467.4	
COEF.OF VARI.(%)	91.5		67.3		62.1		66.5		71.0		75.8	

TABLE A-3 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	8	8.5	13	13.8	10	10.6	4	4.3	10	10.6	8	8.5	41	43.6
REP 2	8	5.8	28	20.4	23	16.8	26	19.0	26	19.0	10	7.3	16	11.7
REP 3	1	0.7	13	9.6	38	28.1	36	26.7	21	15.6	12	8.9	14	10.4
REP 4	6	4.5	13	9.8	29	21.8	31	23.3	25	18.8	19	14.3	10	7.5
REP 5	2	1.9	12	11.4	19	18.1	25	23.8	17	16.2	15	14.3	15	14.3
TOTAL	25	4.1	79	13.1	119	19.7	122	20.2	99	16.4	64	10.6	96	15.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	31	33.0	82	59.9	107	79.3	94	70.7	72	68.6	386	63.9
DOUBLES(0-170)	16	17.0	31	22.6	10	7.4	14	10.5	9	8.6	80	13.2
MISSES(540-700)	23	24.5	12	8.8	15	11.1	20	15.0	20	19.0	90	14.9
DOUBLE MISS(>700)	24	25.5	12	8.8	3	2.2	5	3.8	4	3.8	48	7.9
MEAN SPACING(mm)	523.2		359.2		368.0		372.3		473.0		409.3	
COEF.OF VARI.(%)	64.8		54.7		42.0		43.8		185.6		102.0	

TABLE A-4 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	5	6.6	7	9.2	6	7.9	8	10.5	5	6.6	8	10.5	37	48.7
REP 2	4	6.9	4	6.9	4	6.9	2	3.4	5	8.6	6	10.3	33	56.9
REP 3	2	2.9	1	1.5	3	4.4	4	5.9	4	5.9	10	14.7	44	64.7
REP 4	13	12.7	5	4.9	6	5.9	29	28.4	9	8.8	9	8.8	31	30.4
REP 5	9	10.8	2	2.4	4	4.8	19	22.9	6	7.2	6	7.2	37	44.6
TOTAL	33	8.5	19	4.9	23	5.9	62	16.0	29	7.5	39	10.1	182	47.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	24	31.6	11	19.0	12	17.6	49	48.0	32	38.6	128	33.1
DOUBLES(0-170)	10	13.2	8	13.8	2	2.9	17	16.7	9	10.8	46	11.9
MISSES(540-700)	11	14.5	13	22.4	18	26.5	13	12.7	10	12.0	65	16.8
DOUBLE MISS(>700)	31	40.8	26	44.8	36	52.9	23	22.5	32	38.6	148	38.2
MEAN SPACING(mm)	648.7		848.8		732.1		487.4		593.9		639.0	
COEF.OF VARI.(%)	79.9		89.5		43.6		69.1		61.4		74.7	

TABLE A-5 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	18	12.0	14	9.3	25	16.7	55	36.7	26	17.3	2	1.3	10	6.7
REP 2	14	8.8	24	15.1	24	15.1	68	42.8	17	10.7	8	5.0	4	2.5
REP 3	17	10.9	13	8.3	32	20.5	61	39.1	23	14.7	4	2.6	6	3.8
REP 4	17	13.4	11	8.7	32	25.2	33	26.0	21	16.5	8	6.3	5	3.9
REP 5	15	9.6	16	10.2	32	20.4	59	37.6	25	15.9	6	3.8	4	2.5
TOTAL	81	10.8	78	10.4	145	19.4	276	36.8	112	15.0	28	3.7	29	3.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	114	76.0	123	77.4	124	79.5	91	71.7	121	77.1	573	76.5
DOUBLES(0-170)	25	16.7	28	17.6	24	15.4	27	21.3	27	17.2	131	17.5
MISSES(540-700)	7	4.7	7	4.4	6	3.8	7	5.5	7	4.5	34	4.5
DOUBLE MISS(>700)	4	2.7	1	0.6	2	1.3	2	1.6	2	1.3	11	1.5
MEAN SPACING(mm)	329.7		312.3		318.5		391.7		317.5		331.6	
COEF.OF VARI.(%)	50.3		43.6		44.0		244.7		45.0		125.5	

TABLE A-6 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	3	3.4	3	3.4	17	19.5	13	14.9	9	10.3	9	10.3	33	37.9
REP 2	6	5.6	13	12.1	12	11.2	24	22.4	17	15.9	13	12.1	22	20.6
REP 3	21	17.5	9	7.5	16	13.3	24	20.0	15	12.5	10	8.3	25	20.8
REP 4	2	3.3	3	5.0	4	6.7	8	13.3	10	16.7	5	8.3	28	46.7
REP 5	2	2.3	5	5.7	14	16.1	16	18.4	11	12.6	7	8.0	32	36.8
TOTAL	34	7.4	33	7.2	63	13.7	85	18.4	62	13.4	44	9.5	140	30.4

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	46	52.9	64	59.8	62	51.7	25	41.7	46	52.9	243	52.7
DOUBLES(0-170)	3	3.4	13	12.1	27	22.5	3	5.0	5	5.7	51	11.1
MISSES(540-700)	18	20.7	17	15.8	18	15.0	8	13.3	11	12.6	72	15.6
DOUBLE MISS(>700)	20	23.0	13	12.1	13	10.8	24	40.0	25	28.7	95	20.6
MEAN SPACING(mm)	566.1		462.7		404.4		819.5		573.0		534.3	
COEF.OF VARI.(%)	76.0		69.0		73.6		93.0		65.7		83.4	

TABLE A-7 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	1	1.0	11	11.0	16	16.0	13	13.0	13	13.0	14	14.0	32	32.0
REP 2	11	8.0	20	14.5	26	18.8	18	13.0	35	25.4	15	10.9	13	9.4
REP 3	11	7.7	20	14.0	31	21.7	25	17.5	33	23.1	14	9.8	9	6.3
REP 4	8	8.1	11	11.1	14	14.1	7	7.1	9	9.1	11	11.1	39	39.4
REP 5	11	10.0	10	9.1	14	12.7	14	12.7	19	17.3	7	6.4	35	31.8
TOTAL	42	7.1	72	12.2	101	17.1	77	13.1	109	18.5	61	10.3	128	21.7

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	49	49.0	96	69.6	100	69.9	33	33.3	50	45.5	328	55.6
DOUBLES(0-170)	9	9.0	24	17.4	24	16.8	16	16.2	19	17.3	92	15.6
MISSES(540-700)	21	21.0	13	9.4	17	11.9	29	29.3	24	21.8	104	17.6
DOUBLE MISS(>700)	21	21.0	5	3.6	2	1.4	21	21.2	17	15.5	66	11.2
MEAN SPACING(mm)	494.7		360.1		346.1		491.1		448.5		418.0	
COEF.OF VARI.(%)	56.8		49.4		48.5		58.9		57.2		57.4	

TABLE A-8 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	10	9.9	9	8.9	16	15.8	15	14.9	13	12.9	7	6.9	31	30.7
REP 2	2	2.9	2	2.9	10	14.7	13	19.1	0	0.0	5	7.4	36	52.9
REP 3	9	9.6	10	10.6	9	9.6	16	17.0	9	9.6	2	2.1	39	41.5
REP 4	6	4.8	14	11.2	25	20.0	28	22.4	24	19.2	11	8.8	17	13.6
REP 5	15	12.9	15	12.9	14	12.1	23	19.8	14	12.1	5	4.3	30	25.9
TOTAL	42	8.3	50	9.9	74	14.7	95	18.8	60	11.9	30	6.0	153	30.4

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	51	50.5	28	41.2	38	40.4	82	65.6	59	50.9	258	51.2
DOUBLES(0-170)	16	15.8	2	2.9	15	16.0	16	12.8	24	20.7	73	14.5
MISSES(540-700)	17	16.8	12	17.6	15	16.0	13	10.4	12	10.3	69	13.7
DOUBLE MISS(>700)	17	16.8	26	38.2	26	27.7	14	11.2	21	18.1	104	20.6
MEAN SPACING(mm)	487.2		670.7		528.3		396.3		427.2		483.3	
COEF.OF VARI.(%)	76.3		63.7		68.6		55.5		74.5		71.3	

TABLE A-9 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	19	13.5	19	13.5	32	22.7	23	16.3	18	12.8	9	6.4	21	14.9
REP 2	16	11.0	22	15.1	34	23.3	20	13.7	25	17.1	14	9.6	15	10.3
REP 3	16	10.4	26	16.8	29	18.8	37	24.0	24	15.6	13	8.4	9	5.8
REP 4	16	10.4	30	19.5	34	22.1	30	19.5	24	15.6	9	5.8	11	7.1
REP 5	18	11.0	39	23.9	31	19.0	34	20.9	21	12.9	8	4.9	12	7.4
TOTAL	85	11.2	136	17.9	160	21.1	144	19.0	112	14.8	53	7.0	68	9.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	89	63.1	93	63.7	106	68.8	106	68.8	100	61.3	494	65.2
DOUBLES(0-170)	30	21.3	30	20.5	32	20.8	33	21.4	46	28.2	171	22.6
MISSES(540-700)	13	9.2	18	12.3	14	9.1	8	5.2	8	4.9	61	8.0
DOUBLE MISS(>700)	9	6.4	5	3.4	2	1.3	7	4.5	9	5.5	32	4.2
MEAN SPACING(mm)	351.3		338.5		321.3		320.7		304.1		326.4	
COEF.OF VARI.(%)	63.1		56.2		54.3		60.3		63.9		59.8	

TABLE A-10 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	21	16.2	20	15.4	18	13.8	19	14.6	14	10.8	11	8.5	27	20.8
REP 2	20	15.9	28	22.2	12	9.5	12	9.5	21	16.7	5	4.0	28	22.2
REP 3	16	12.7	12	9.5	21	16.7	18	14.3	20	15.9	18	14.3	21	16.7
REP 4	20	13.8	26	17.9	21	14.5	36	24.8	15	10.3	14	9.7	13	9.0
RER 5	13	10.0	17	13.1	25	19.2	27	20.8	14	10.8	14	10.8	20	15.4
TOTAL	90	13.7	103	15.7	97	14.8	112	17.0	84	12.8	62	9.4	109	16.6

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	62	47.7	54	42.9	67	53.2	87	60.0	76	58.5	346	52.7
DOUBLES(0-170)	36	27.7	41	32.5	24	19.0	37	25.5	25	19.2	163	24.8
MISSES(540-700)	14	10.8	15	11.9	24	19.0	11	7.6	16	12.3	80	12.2
DOUBLE MISS(>700)	18	13.8	16	12.7	11	8.7	10	6.9	13	10.0	68	10.4
MEAN SPACING(mm)	381.4		385.2		394.8		341.7		378.2		375.3	
COEF.OF VARI.(%)	72.3		83.7		60.8		70.8		53.8		70.7	

TABLE A-11 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	16	11.9	20	14.8	18	13.3	26	19.3	24	17.8	15	11.1	16	11.9
REP 2	14	13.3	9	8.6	15	14.3	13	12.4	13	12.4	10	9.5	31	29.5
REP 3	8	6.1	12	9.1	25	18.9	37	28.0	22	16.7	11	8.3	17	12.9
REP 4	3	2.1	10	7.0	29	20.3	59	41.3	32	22.4	7	4.9	3	2.1
REP 5	6	4.6	6	4.6	28	21.4	41	31.3	27	20.6	11	8.4	12	9.2
TOTAL	47	7.3	57	8.8	115	17.8	176	27.2	118	18.3	54	8.4	79	12.2

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	79	58.5	48	45.7	88	66.7	125	87.4	103	78.6	443	68.6
DOUBLES(0-170)	29	21.5	21	20.0	17	12.9	10	7.0	12	9.2	89	13.8
MISSES(540-700)	17	12.6	11	10.5	20	15.2	7	4.9	10	7.6	65	10.1
DOUBLE MISS(>700)	10	7.4	25	23.8	7	5.3	1	0.7	6	4.6	49	7.6
MEAN SPACING(mm)	367.8		467.3		376.0		348.0		376.4		383.0	
COEF.OF VARI.(%)	58.0		68.9		47.7		32.2		43.4		53.7	

TABLE A-12 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	18	14.6	17	13.8	15	12.2	21	17.1	19	15.4	7	5.7	26	21.1
REP 2	19	15.0	16	12.6	14	11.0	24	18.9	14	11.0	14	11.0	26	20.5
REP 3	18	15.4	10	8.5	12	10.3	21	17.9	15	12.8	14	12.0	27	23.1
REP 4	13	12.1	8	7.5	11	10.3	9	8.4	30	28.0	11	10.3	25	23.4
REP 5	11	11.5	3	3.1	9	9.4	18	18.8	18	18.8	5	5.2	32	33.3
TOTAL	79	13.9	54	9.5	61	10.7	93	16.3	96	16.8	51	8.9	136	23.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	61	49.6	65	51.2	55	47.0	55	51.4	46	47.9	282	49.5
DOUBLES(0-170)	31	25.2	30	23.6	27	23.1	20	18.7	14	14.6	122	21.4
MISSES(540-700)	15	12.2	17	13.4	19	16.2	13	12.1	8	8.3	72	12.6
DOUBLE MISS(>700)	16	13.0	15	11.8	16	13.7	19	17.8	28	29.2	94	16.5
MEAN SPACING(mm)	405.3		390.8		419.7		463.3		513.3		434.1	
COEF.OF VARI.(%)	74.7		64.0		68.8		66.0		64.6		68.4	

TABLE A-13 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	22	13.6	23	14.2	35	21.6	42	25.9	26	16.0	8	4.9	6	3.7
REP 2	20	12.5	18	11.3	28	17.5	61	38.1	22	13.8	6	3.8	5	3.1
REP 3	17	10.8	14	8.9	34	21.7	53	33.8	28	17.8	5	3.2	6	3.8
REP 4	9	6.3	17	11.9	33	23.1	40	28.0	20	14.0	13	9.1	11	7.7
REP 5	19	11.4	25	15.0	41	24.6	46	27.5	25	15.0	7	4.2	4	2.4
TOTAL	87	11.0	97	12.3	171	21.7	242	30.7	121	15.3	39	4.9	32	4.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	118	72.8	120	75.0	120	76.4	105	73.4	124	74.3	587	74.4
DOUBLES(0-170)	34	21.0	32	20.0	28	17.8	21	14.7	35	21.0	150	19.0
MISSES(540-700)	7	4.3	6	3.8	7	4.5	14	9.8	7	4.2	41	5.2
DOUBLE MISS(>700)	3	1.9	2	1.3	2	1.3	3	2.1	1	0.6	11	1.4
MEAN SPACING(mm)	305.9		309.4		317.9		346.2		298.4		314.7	
COEF.OF VARI.(%)	56.1		45.8		46.5		49.6		48.7		49.7	

TABLE A-14 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	10	10.4	7	7.3	7	7.3	14	14.6	19	19.8	10	10.4	29	30.2
REP 2	9	9.6	12	12.8	14	14.9	8	8.5	11	11.7	10	10.6	30	31.9
REP 3	17	13.2	15	11.6	25	19.4	21	16.3	21	16.3	11	8.5	19	14.7
REP 4	13	11.9	6	5.5	16	14.7	23	21.1	11	10.1	12	11.0	28	25.7
REP 5	11	13.3	8	9.6	4	4.8	4	4.8	3	3.6	15	18.1	38	45.8
TOTAL	60	11.7	48	9.4	66	12.9	70	13.7	65	12.7	58	11.4	144	28.2

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	47	49.0	37	39.4	74	57.4	54	49.5	18	21.7	230	45.0
DOUBLES(0-170)	14	14.6	19	20.2	26	20.2	16	14.7	16	19.3	91	17.8
MISSES(540-700)	16	16.7	17	18.1	14	10.9	19	17.4	22	26.5	88	17.2
DOUBLE MISS(>700)	19	19.8	21	22.3	15	11.6	20	18.3	27	32.5	102	20.0
MEAN SPACING(mm)	518.4		512.2		380.5		451.7		592.5		480.3	
COEF.OF VARI.(%)	77.1		78.8		67.9		67.0		67.4		74.1	

TABLE A-15 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	5	4.0	24	19.0	20	15.9	24	19.0	21	16.7	16	12.7	16	12.7
REP 2	19	13.2	22	15.3	22	15.3	29	20.1	25	17.4	14	9.7	13	9.0
REP 3	16	11.3	24	16.9	21	14.8	26	18.3	23	16.2	15	10.6	17	12.0
REP 4	15	10.8	23	16.5	14	10.1	30	21.6	27	19.4	14	10.1	16	11.5
REP 5	17	11.6	26	17.8	31	21.2	25	17.1	16	11.0	13	8.9	18	12.3
TOTAL	72	10.3	119	17.1	108	15.5	134	19.2	112	16.1	72	10.3	80	11.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	79	62.7	91	63.2	80	56.3	83	59.7	86	58.9	419	60.1
DOUBLES(0-170)	22	17.5	32	22.2	34	23.9	32	23.0	35	24.0	155	22.2
MISSES(540-700)	13	10.3	14	9.7	22	15.5	19	13.7	18	12.3	86	12.3
DOUBLE MISS(>700)	12	9.5	7	4.9	6	4.2	5	3.6	7	4.8	37	5.3
MEAN SPACING(mm)	392.8		343.6		349.2		358.1		337.6		355.3	
COEF.OF VARI.(%)	57.3		60.5		56.5		54.4		60.8		58.0	

TABLE A-16 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 350 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE_GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	14	11.5	18	14.8	22	18.0	20	16.4	16	13.1	8	6.6	24	19.7
REP 2	5	8.3	4	6.7	4	6.7	4	6.7	3	5.0	5	8.3	35	58.3
REP 3	4	4.1	23	23.5	6	6.1	15	15.3	7	7.1	14	14.3	29	29.6
REP 4	9	7.9	19	16.7	20	17.5	12	10.5	16	14.0	13	11.4	25	21.9
REP 5	13	12.4	14	13.3	15	14.3	15	14.3	11	10.5	9	8.6	28	26.7
TOTAL	45	9.0	78	15.6	67	13.4	66	13.2	53	10.6	49	9.8	141	28.3

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(180-530)	67	54.9	12	20.0	37	37.8	60	52.6	49	46.7	225	45.1
DOUBLES(0-170)	25	20.5	9	15.0	21	21.4	23	20.2	23	21.9	101	20.2
MISSES(540-700)	13	10.7	9	15.0	18	18.4	15	13.2	14	13.3	69	13.8
DOUBLE MISS(>700)	17	13.9	30	50.0	22	22.4	16	14.0	19	18.1	104	20.8
MEAN SPACING(mm)	407.0		804.7		503.7		433.3		470.7		493.2	
COEF.OF VARI.(%)	74.4		73.9		75.7		70.5		90.3		82.6	

TABLE A-17 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	12	9.4	15	11.8	25	19.7	21	16.5	13	10.2	15	11.8	26	20.5
REP 2	13	10.0	15	11.5	28	21.5	16	12.3	19	14.6	16	12.3	23	17.7
REP 3	7	6.0	14	12.1	10	8.6	16	13.8	25	21.6	26	22.4	18	15.5
REP 4	4	3.6	10	9.0	10	9.0	17	15.3	31	27.9	15	13.5	24	21.6
REP 5	6	5.3	8	7.1	10	8.8	18	15.9	31	27.4	23	20.4	17	15.0
TOTAL	42	7.0	62	10.4	83	13.9	88	14.7	119	19.9	95	15.9	108	18.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	83	65.4	88	67.7	80	69.0	79	71.2	84	74.3	414	69.3
DOUBLES(0-220)	33	26.0	34	26.2	25	21.6	20	18.0	20	17.7	132	22.1
MISSES(700-920)	11	8.7	7	5.4	10	8.6	12	10.8	9	8.0	49	8.2
DOUBLE MISS(>920)	0	0.0	1	0.8	1	0.9	0	0.0	0	0.0	2	0.3
MEAN SPACING(mm)	389.9		382.9		428.3		446.0		437.9		415.4	
COEF.OF VARI.(%)	55.6		54.6		47.2		43.7		42.1		48.9	

TABLE A-18 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	11	10.7	9	8.7	21	20.4	12	11.7	9	8.7	11	10.7	30	29.1
REP 2	21	16.7	10	7.9	28	22.2	12	9.5	10	7.9	19	15.1	26	20.6
REP 3	7	6.5	13	12.1	9	8.4	9	8.4	20	18.7	26	24.3	23	21.5
REP 4	7	6.7	12	11.4	6	5.7	15	14.3	20	19.0	14	13.3	31	29.5
REP 5	3	3.0	7	6.9	12	11.9	14	13.9	18	17.8	19	18.8	28	27.7
TOTAL	49	9.0	51	9.4	76	14.0	62	11.4	77	14.2	89	16.4	138	25.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	56	54.4	75	59.5	64	59.8	62	59.0	63	62.4	320	59.0
DOUBLES(0-220)	22	21.4	34	27.0	25	23.4	23	21.9	18	17.8	122	22.5
MISSES(700-920)	18	17.5	14	11.1	14	13.1	18	17.1	16	15.8	80	14.8
DOUBLE MISS(>920)	7	6.8	3	2.4	4	3.7	2	1.9	4	4.0	20	3.7
MEAN SPACING(mm)	476.5		392.4		464.2		473.0		489.2		456.2	
COEF.OF VARI.(%)	69.8		66.2		53.0		53.6		47.2		58.7	

TABLE A-19 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	7	5.8	11	9.2	15	12.5	27	22.5	24	20.0	22	18.3	14	11.7
REP 2	6	5.3	9	7.9	18	15.8	23	20.2	17	14.9	19	16.7	22	19.3
REP 3	2	1.7	15	12.8	14	12.0	25	21.4	28	23.9	13	11.1	20	17.1
REP 4	1	0.9	13	12.0	13	12.0	17	15.7	18	16.7	15	13.9	31	28.7
REP 5	0	0.0	18	16.8	9	8.4	13	12.1	20	18.7	21	19.6	26	24.3
TOTAL	16	2.8	66	11.7	69	12.2	105	18.6	107	18.9	90	15.9	113	20.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	91	75.8	84	73.7	85	72.6	74	68.5	72	67.3	406	71.7
DOUBLES(0-220)	21	17.5	18	15.8	22	18.8	20	18.5	23	21.5	104	18.4
MISSES(700-920)	6	5.0	10	8.8	9	7.7	12	11.1	12	11.2	49	8.7
DOUBLE MISS(>920)	2	1.7	2	1.8	1	0.9	2	1.9	0	0.0	7	1.2
MEAN SPACING(mm)	412.7		433.9		422.1		458.3		460.9		436.7	
COEF.OF VARI.(%)	47.3		47.6		46.0		44.9		43.7		46.0	

TABLE A-20 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	11	9.9	14	12.6	13	11.7	19	17.1	17	15.3	7	6.3	30	27.0
REP 2	7	7.6	14	15.2	7	7.6	9	9.8	11	12.0	12	13.0	32	34.8
REP 3	5	4.6	11	10.2	17	15.7	20	18.5	14	13.0	12	11.1	29	26.9
REP 4	10	9.6	11	10.6	6	5.8	13	12.5	17	16.3	12	11.5	35	33.7
REP 5	12	11.7	12	11.7	8	7.8	15	14.6	14	13.6	10	9.7	32	31.1
TOTAL	45	8.7	62	12.0	51	9.8	76	14.7	73	14.1	53	10.2	158	30.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	63	56.8	44	47.8	67	62.0	59	56.7	53	51.5	286	55.2
DOUBLES(0-220)	27	24.3	22	23.9	23	21.3	24	23.1	28	27.2	124	23.9
MISSES(700-920)	15	13.5	15	16.3	13	12.0	17	16.3	16	15.5	76	14.7
DOUBLE MISS(>920)	6	5.4	11	12.0	5	4.6	4	3.8	6	5.8	32	6.2
MEAN SPACING(mm)	443.1		529.0		456.4		475.0		457.0		470.3	
COEF.OF VARI.(%)	65.0		71.0		56.4		55.3		61.4		62.5	

TABLE A-21 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	11	8.4	22	16.8	32	24.4	12	9.2	9	6.9	18	13.7	27	20.6
REP 2	17	13.1	21	16.2	19	14.6	18	13.8	10	7.7	19	14.6	26	20.0
REP 3	9	7.4	17	13.9	15	12.3	19	15.6	23	18.9	16	13.1	23	18.9
REP 4	12	9.1	13	9.8	32	24.2	25	18.9	21	15.9	9	6.8	20	15.2
REP 5	7	5.3	19	14.4	28	21.2	31	23.5	19	14.4	7	5.3	21	15.9
TOTAL	56	8.7	92	14.2	126	19.5	105	16.2	82	12.7	69	10.7	117	18.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	83	63.4	77	59.2	77	63.1	88	66.7	86	65.2	411	63.5
DOUBLES(0-220)	39	29.8	40	30.8	30	24.6	33	25.0	35	26.5	177	27.4
MISSES(700-920)	9	6.9	11	8.5	14	11.5	8	6.1	9	6.8	51	7.9
DOUBLE MISS(>920)	0	0.0	2	1.5	1	0.8	3	2.3	2	1.5	8	1.2
MEAN SPACING(mm)	380.9		383.1		407.7		374.7		374.1		383.7	
COEF.OF VARI.(%)	57.5		63.1		51.9		59.0		54.1		57.1	

TABLE A-22 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	30	22.2	19	14.1	20	14.8	14	10.4	11	8.1	16	11.9	25	18.5
REP 2	17	13.6	19	15.2	25	20.0	10	8.0	17	13.6	10	8.0	27	21.6
REP 3	11	10.0	12	10.9	16	14.5	14	12.7	12	10.9	12	10.9	33	30.0
REP 4	12	11.0	12	11.0	18	16.5	10	9.2	13	11.9	9	8.3	35	32.1
REP 5	8	8.2	14	14.4	9	9.3	12	12.4	11	11.3	11	11.3	32	33.0
TOTAL	78	13.5	76	13.2	88	15.3	60	10.4	64	11.1	58	10.1	152	26.4

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	59	43.7	65	52.0	59	53.6	58	53.2	46	47.4	287	49.8
DOUBLES(0-220)	57	42.2	42	33.6	32	29.1	27	24.8	29	29.9	187	32.5
MISSES(700-920)	12	8.9	10	8.0	11	10.0	20	18.3	17	17.5	70	12.2
DOUBLE MISS(>920)	7	5.2	8	6.4	8	7.3	4	3.7	5	5.2	32	5.6
MEAN SPACING(mm)	363.7		395.0		451.6		450.6		462.5		420.4	
COEF.OF VARI.(%)	80.2		74.3		62.7		62.7		59.1		68.4	

TABLE A-23 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	8	7.1	8	7.1	18	16.1	19	17.0	14	12.5	17	15.2	28	25.0
REP 2	6	5.2	13	11.3	18	15.7	21	18.3	15	13.0	11	9.6	31	27.0
REP 3	6	5.5	3	2.8	16	14.7	16	14.7	22	20.2	23	21.1	23	21.1
REP 4	3	2.8	8	7.3	14	12.8	12	11.0	28	25.7	23	21.1	21	19.3
REP 5	3	2.7	10	8.8	12	10.6	25	22.1	27	23.9	14	12.4	22	19.5
TOTAL	26	4.7	42	7.5	78	14.0	93	16.7	106	19.0	88	15.8	125	22.4

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	84	75.0	81	70.4	84	77.1	86	78.9	81	71.7	416	74.6
DOUBLES(0-220)	17	15.2	24	20.9	14	12.8	13	11.9	19	16.8	87	15.6
MISSES(700-920)	9	8.0	9	7.8	10	9.2	9	8.3	12	10.6	49	8.8
DOUBLE MISS(>920)	2	1.8	1	0.9	1	0.9	1	0.9	1	0.9	6	1.1
MEAN SPACING(mm)	438.9		429.8		456.2		454.8		438.0		443.3	
COEF.OF VARI.(%)	48.9		51.1		42.6		41.4		44.1		45.6	

TABLE A-24 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 5 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	3	3.0	11	11.1	18	18.2	6	6.1	16	16.2	14	14.1	31	31.3
REP 2	2	2.9	7	10.1	11	15.9	2	2.9	2	2.9	7	10.1	38	55.1
REP 3	1	1.1	6	6.7	6	6.7	11	12.4	10	11.2	21	23.6	34	38.2
REP 4	2	2.5	0	0.0	4	5.1	7	8.9	15	19.0	15	19.0	36	45.6
REP 5	2	2.4	6	7.1	5	5.9	4	4.7	17	20.0	11	12.9	40	47.1
TOTAL	10	2.4	30	7.1	44	10.5	30	7.1	60	14.3	68	16.2	179	42.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	56	56.6	27	39.1	52	58.4	45	57.0	48	56.5	228	54.2
DOUBLES(0-220)	19	19.2	10	14.5	10	11.2	2	2.5	10	11.8	51	12.1
MISSES(700-920)	20	20.2	18	26.1	22	24.7	24	30.4	20	23.5	104	24.7
DOUBLE MISS(>920)	4	4.0	14	20.3	5	5.6	8	10.1	7	8.2	38	9.0
MEAN SPACING(mm)	496.5		711.3		556.0		624.9		577.1		584.6	
COEF.OF VARI.(%)	57.1		79.1		41.2		39.1		44.7		56.8	

TABLE A-25 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	12	9.4	11	8.7	34	26.8	16	12.6	13	10.2	21	16.5	20	15.7
REP 2	22	16.9	17	13.1	18	13.8	18	13.8	13	10.0	16	12.3	26	20.0
REP 3	7	6.7	12	11.5	4	3.8	15	14.4	18	17.3	18	17.3	30	28.8
REP 4	4	4.0	9	8.9	10	9.9	9	8.9	23	22.8	16	15.8	30	29.7
REP 5	5	4.6	16	14.7	10	9.2	18	16.5	15	13.8	15	13.8	30	27.5
TOTAL	50	8.8	65	11.4	76	13.3	76	13.3	82	14.4	86	15.1	136	23.8

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	86	67.7	72	55.4	64	61.5	68	67.3	72	66.1	362	63.4
DOUBLES(0-220)	31	24.4	42	32.3	21	20.2	17	16.8	22	20.2	133	23.3
MISSES(700-920)	8	6.3	13	10.0	16	15.4	13	12.9	13	11.9	63	11.0
DOUBLE MISS(>920)	2	1.6	3	2.3	3	2.9	3	3.0	2	1.8	13	2.3
MEAN SPACING(mm)	392.6		383.4		471.0		490.0		451.7		433.3	
COEF.OF VARI.(%)	62.0		68.5		50.1		50.4		50.3		57.0	

TABLE A-26 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	19	15.2	12	9.6	15	12.0	17	13.6	17	13.6	20	16.0	25	20.0
REP 2	22	17.6	11	8.8	20	16.0	18	14.4	11	8.8	13	10.4	30	24.0
REP 3	4	4.0	9	9.0	12	12.0	11	11.0	12	12.0	21	21.0	31	31.0
REP 4	5	4.8	8	7.7	14	13.5	11	10.6	16	15.4	24	23.1	26	25.0
REP 5	3	2.9	9	8.7	14	13.5	15	14.4	20	19.2	15	14.4	28	26.9
TOTAL	53	9.5	49	8.8	75	13.4	72	12.9	76	13.6	93	16.7	140	25.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	80	64.0	68	54.4	65	65.0	73	70.2	70	67.3	356	63.8
DOUBLES(0-220)	34	27.2	36	28.8	16	16.0	14	13.5	15	14.4	115	20.6
MISSES(700-920)	11	8.8	19	15.2	14	14.0	14	13.5	16	15.4	74	13.3
DOUBLE MISS(>920)	0	0.0	2	1.6	5	5.0	3	2.9	3	2.9	13	2.3
MEAN SPACING(mm)	396.2		397.0		492.3		476.3		478.6		443.9	
COEF.OF VARI.(%)	59.3		65.6		49.4		49.6		52.0		55.9	

TABLE A-27 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	14	11.8	10	8.4	11	9.2	20	16.8	21	17.6	21	17.6	22	18.5
REP 2	9	7.5	11	9.2	15	12.5	23	19.2	19	15.8	23	19.2	20	16.7
REP 3	0	0.0	16	14.8	5	4.6	12	11.1	28	25.9	27	25.0	20	18.5
REP 4	5	4.5	12	10.7	9	8.0	16	14.3	26	23.2	23	20.5	21	18.8
REP 5	5	4.4	10	8.8	13	11.4	15	13.2	24	21.1	29	25.4	18	15.8
TOTAL	33	5.8	59	10.3	53	9.2	86	15.0	118	20.6	123	21.5	101	17.6

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	80	67.2	93	77.5	81	75.0	82	73.2	89	78.1	425	74.2
DOUBLES(0-220)	27	22.7	20	16.7	18	16.7	19	17.0	17	14.9	101	17.6
MISSES(700-920)	9	7.6	7	5.8	9	8.3	11	9.8	8	7.0	44	7.7
DOUBLE MISS(>920)	3	2.5	0	0.0	0	0.0	0	0.0	0	0.0	3	0.5
MEAN SPACING(mm)	418.6		414.8		459.0		442.9		434.2		433.3	
COEF.OF VARI.(%)	54.5		45.6		38.4		44.1		41.1		45.0	

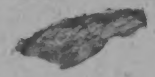

TABLE A-28 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	3	4.7	2	3.1	3	4.7	2	3.1	7	10.9	6	9.4	41	64.1
REP 2	12	11.4	11	10.5	10	9.5	15	14.3	15	14.3	14	13.3	28	26.7
REP 3	5	5.2	11	11.5	7	7.3	9	9.4	14	14.6	14	14.6	36	37.5
REP 4	6	6.8	5	5.7	7	8.0	13	14.8	7	8.0	11	12.5	39	44.3
REP 5	6	5.9	13	12.7	9	8.8	11	10.8	16	15.7	16	15.7	31	30.4
TOTAL	32	7.0	42	9.2	36	7.9	50	11.0	59	13.0	61	13.4	175	38.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	25	39.1	56	53.3	50	52.1	45	51.1	54	52.9	230	50.5
DOUBLES(0-220)	5	7.8	25	23.8	22	22.9	14	15.9	25	24.5	91	20.0
MISSES(700-920)	9	14.1	13	12.4	19	19.8	20	22.7	20	19.6	81	17.8
DOUBLE MISS(>920)	25	39.1	11	10.5	5	5.2	9	10.2	3	2.9	53	11.6
MEAN SPACING(mm)	777.2		471.6		515.8		561.0		482.8		543.7	
COEF.OF VARI.(%)	52.6		66.3		54.8		53.1		54.3		59.5	

TABLE A-29 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	21	16.0	21	16.0	18	13.7	14	10.7	15	11.5	16	12.2	26	19.8
REP 2	16	12:1	23	17.4	16	12.1	22	16.7	15	11.4	14	10.6	26	19.7
REP 3	8	6.0	25	18.7	17	12.7	34	25.4	21	15.7	9	6.7	20	14.9
REP 4	9	7.1	21	16.7	19	15.1	22	17.5	17	13.5	11	8.7	27	21.4
REP 5	9	6.5	27	19.6	23	16.7	26	18.8	24	17.4	14	10.1	15	10.9
TOTAL	63	9.5	117	17.7	93	14.1	118	17.9	92	13.9	64	9.7	114	17.2

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	66	50.4	79	59.8	81	60.4	76	60.3	85	61.6	387	58.5
DOUBLES(0-220)	47	35.9	42	31.8	40	29.9	38	30.2	44	31.9	211	31.9
MISSES(700-920)	17	13.0	9	6.8	11	8.2	11	8.7	8	5.8	56	8.5
DOUBLE MISS(>920)	1	0.8	2	1.5	2	1.5	1	0.8	1	0.7	7	1.1
MEAN SPACING(mm)	379.5		375.4		369.8		395.2		357.5		375.1	
COEF.OF VARI.(%)	66.1		59.4		56.2		58.0		56.3		59.3	

TABLE A-30 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	20	15.0	15	11.3	21	15.8	24	18.0	18	13.5	13	9.8	22	16.5
REP 2	25	19.7	23	18.1	14	11.0	15	11.8	9	7.1	12	9.4	29	22.8
REP 3	7	6.5	12	11.2	12	11.2	7	6.5	12	11.2	30	28.0	27	25.2
REP 4	6	5.7	21	19.8	8	7.5	7	6.6	12	11.3	25	23.6	27	25.5
REP 5	9	8.3	13	12.0	17	15.7	10	9.3	15	13.9	14	13.0	30	27.8
TOTAL	67	11.5	84	14.5	72	12.4	63	10.8	66	11.4	94	16.2	135	23.2

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	79	59.4	51	40.2	64	59.8	55	51.9	52	48.1	301	51.8
DOUBLES(0-220)	40	30.1	51	40.2	29	27.1	32	30.2	33	30.6	185	31.8
MISSES(700-920)	12	9.0	17	13.4	11	10.3	12	11.3	18	16.7	70	12.0
DOUBLE MISS(>920)	2	1.5	8	6.3	3	2.8	7	6.6	5	4.6	25	4.3
MEAN SPACING(mm)	374.5		388.0		464.2		467.8		452.2		425.4	
COEF.OF VARI.(%)	68.1		80.0		50.4		60.8		62.7		65.2	

TABLE A-31 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	2	1.7	11	9.5	16	13.8	23	19.8	27	23.3	20	17.2	17	14.7
REP 2	1	0.9	5	4.4	14	12.3	31	27.2	31	27.2	16	14.0	16	14.0
REP 3	2	1.7	8	6.9	12	10.3	24	20.7	41	35.3	15	12.9	14	12.1
REP 4	5	4.3	8	7.0	21	18.3	20	17.4	21	18.3	17	14.8	23	20.0
REP 5	0	0.0	11	10.2	6	5.6	18	16.7	30	27.8	26	24.1	17	15.7
TOTAL	10	1.8	43	7.6	69	12.1	116	20.4	150	26.4	94	16.5	87	15.3

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	92	79.3	94	82.5	95	81.9	86	74.8	88	81.5	455	80.0
DOUBLES(0-220)	14	12.1	10	8.8	16	13.8	18	15.7	14	13.0	72	12.7
MISSES(700-920)	8	6.9	10	8.8	5	4.3	11	9.6	6	5.6	40	7.0
DOUBLE MISS(>920)	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	2	0.4
MEAN SPACING(mm)	428.1		433.9		426.7		429.1		459.1		435.1	
COEF.OF VARI.(%)	41.9		37.0		35.1		43.9		35.4		38.8	

TABLE A-32 SPACINGS OF SEEDS FOR

PLANTER -- MCCONNELL(PICK TYPE), SPEED -- 8 km/h, SPACE SETTING -- 460 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	16	13.4	13	10.9	16	13.4	19	16.0	12	10.1	15	12.6	28	23.5
REP 2	10	8.4	14	11.8	17	14.3	15	12.6	24	20.2	19	16.0	20	16.8
REP 3	5	4.9	6	5.8	8	7.8	18	17.5	22	21.4	16	15.5	28	27.2
REP 4	8	7.1	11	9.7	10	8.8	18	15.9	22	19.5	19	16.8	25	22.1
REP 5	8	7.1	14	12.4	9	8.0	21	18.6	22	19.5	11	9.7	28	24.8
TOTAL	47	8.3	58	10.2	60	10.6	91	16.0	102	18.0	80	14.1	129	22.8

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(230-690)	72	60.5	77	64.7	72	69.9	77	68.1	74	65.5	372	65.6
DOUBLES(0-220)	31	26.1	28	23.5	13	12.6	22	19.5	23	20.4	117	20.6
MISSES(700-920)	13	10.9	10	8.4	16	15.5	12	10.6	13	11.5	64	11.3
DOUBLE MISS(>920)	3	2.5	4	3.4	2	1.9	2	1.8	3	2.7	14	2.5
MEAN SPACING(mm)	414.5		418.2		483.2		439.6		435.8		437.0	
COEF.OF VARI.(%)	69.8		55.2		45.2		50.6		53.7		53.9	

APPENDIX-B

RESULTS OF THE CUP TYPE PLANTER

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A1 B1 C1 D1 E1	87	A2 B1 C1 D1 E1	103
A1 B1 C1 D1 E2	88	A2 B1 C1 D1 E2	104
A1 B1 C1 D2 E1	89	A2 B1 C1 D2 E1	105
A1 B1 C1 D2 E2	90	A2 B1 C1 D2 E2	106
A1 B1 C2 D1 E1	91	A2 B1 C2 D1 E1	107
A1 B1 C2 D1 E2	92	A2 B1 C2 D1 E2	108
A1 B1 C2 D2 E1	93	A2 B1 C2 D2 E1	109
A1 B1 C2 D2 E2	94	A2 B1 C2 D2 E2	110
A1 B2 C1 D1 E1	95	A2 B2 C1 D1 E1	111
A1 B2 C1 D1 E2	96	A2 B2 C1 D1 E2	112
A1 B2 C1 D2 E1	97	A2 B2 C1 D2 E1	113
A1 B2 C1 D2 E2	98	A2 B2 C1 D2 E2	114
A1 B2 C2 D1 E1	99	A2 B2 C2 D1 E1	115
A1 B2 C2 D1 E2	100	A2 B2 C2 D1 E2	116
A1 B2 C2 D2 E1	101	A2 B2 C2 D2 E1	117
A1 B2 C2 D2 E2	102	A2 B2 C2 D2 E2	118

SPACINGS	A1- 380 mm,	A2- 250 mm
SPEEDS	B1- 5 km/h,	B2- 8 km/h
CULTIVARS	C1- NORLAND,	C2- NETTED GEM
SIZES	D1- 40 g,	D2- 60 g
SHAPES	E1- END PIECES,	E2- CENTER CUT

TABLE B-1 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	25	10.8	35	15.2	36	15.6	36	15.6	30	13.0	18	7.8	51	22.1
REP 2	72	20.8	51	14.7	59	17.1	78	22.5	55	15.9	13	3.8	18	5.2
REP 3	55	18.1	53	17.4	38	12.5	55	18.1	50	16.4	18	5.9	35	11.5
REP 4	41	18.9	38	17.5	37	17.1	38	17.5	22	10.1	17	7.8	24	11.1
REP 5	53	16.9	53	16.9	57	18.2	44	14.1	45	14.4	40	12.8	21	6.7
TOTAL	246	17.4	230	16.3	227	16.1	251	17.8	202	14.3	106	7.5	149	10.6

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	115	49.8	205	59.2	162	53.3	111	51.2	182	58.1	775	54.9
DOUBLES(0-190)	57	24.7	119	34.4	103	33.9	77	35.5	102	32.6	458	32.5
MISSES(580-760)	30	13.0	16	4.6	26	8.6	22	10.1	19	6.1	113	8.0
DOUBLE MISS(>760)	29	12.6	6	1.7	13	4.3	7	3.2	10	3.2	65	4.6
MEAN SPACING(mm)	423.8		288.2		325.9		314.4		317.3		329.0	
COEF.OF VARI.(%)	74.6		64.2		68.2		68.0		65.8		70.6	

TABLE B-2 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	32	17.7	27	14.9	19	10.5	22	12.2	17	9.4	7	3.9	57	31.5
REP 2	46	26.0	27	15.3	16	9.0	13	7.3	10	5.6	9	5.1	56	31.6
REP 3	64	26.8	38	15.9	30	12.6	21	8.8	13	5.4	11	4.6	62	25.9
REP 4	68	26.3	44	17.0	31	12.0	32	12.4	22	8.5	13	5.0	49	18.9
REP 5	78	28.0	46	16.5	41	14.7	29	10.4	16	5.7	20	7.2	49	17.6
TOTAL	288	25.4	182	16.0	137	12.1	117	10.3	78	6.9	60	5.3	273	24.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	64	35.4	50	28.2	76	31.8	96	37.1	105	37.6	391	34.4
DOUBLES(0-190)	59	32.6	69	39.0	98	41.0	108	41.7	117	41.9	451	39.7
MISSES(580-760)	15	8.3	11	6.2	23	9.6	19	7.3	25	9.0	93	8.2
DOUBLE MISS(>760)	43	23.8	47	26.6	42	17.6	36	13.9	32	11.5	200	17.6
MEAN SPACING(mm)	539.7		544.0		413.4		376.0		351.9		430.2	
COEF.OF VARI.(%)	113.7		140.1		107.1		101.4		100.1		118.7	

TABLE B-3 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	10	4.7	19	8.9	31	14.5	48	22.4	41	19.2	18	8.4	47	22.0
REP 2	13	6.2	16	7.6	29	13.7	37	17.5	46	21.8	24	11.4	46	21.8
REP 3	14	6.6	10	4.7	34	16.0	32	15.1	39	18.4	29	13.7	54	25.5
REP 4	17	7.1	28	11.8	30	12.6	65	27.3	34	14.3	25	10.5	39	16.4
REP 5	16	6.6	29	11.9	34	14.0	54	22.2	51	21.0	19	7.8	40	16.5
TOTAL	70	6.3	102	9.1	158	14.1	236	21.1	211	18.9	115	10.3	226	20.2

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	138	64.5	132	62.6	133	62.7	151	63.4	161	66.3	715	64.0
DOUBLES(0-190)	26	12.1	29	13.7	23	10.8	43	18.1	40	16.5	161	14.4
MISSES(580-760)	22	10.3	23	10.9	31	14.6	21	8.8	26	10.7	123	11.0
DOUBLE MISS(>760)	28	13.1	27	12.8	25	11.8	23	9.7	16	6.6	119	10.6
MEAN SPACING(mm)	461.2		467.7		468.6		414.7		407.9		442.3	
COEF.OF VARI.(%)	60.6		59.5		54.4		58.1		56.4		58.2	

TABLE B-4 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	17	11.3	18	12.0	20	13.3	14	9.3	8	5.3	11	7.3	62	41.3
REP 2	27	15.3	25	14.1	18	10.2	20	11.3	16	9.0	15	8.5	56	31.6
REP 3	25	13.1	7	3.7	16	8.4	30	15.7	37	19.4	21	11.0	55	28.8
REP 4	15	7.5	7	3.5	13	6.5	51	25.5	35	17.5	22	11.0	57	28.5
REP 5	31	14.0	8	3.6	28	12.6	44	19.8	33	14.9	18	8.1	60	27.0
TOTAL	115	12.2	65	6.9	95	10.1	159	16.9	129	13.7	87	9.3	290	30.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	52	34.7	67	37.9	100	52.4	117	58.5	118	53.2	454	48.3
DOUBLES(0-190)	33	22.0	51	28.8	32	16.8	22	11.0	39	17.6	177	18.8
MISSES(580-760)	17	11.3	18	10.2	31	16.2	29	14.5	37	16.7	132	14.0
DOUBLE MISS(>760)	48	32.0	41	23.2	28	14.7	32	16.0	28	12.6	177	18.8
MEAN SPACING(mm)	657.4		554.1		516.5		489.6		445.5		523.6	
COEF.OF VARI.(%)	92.8		99.7		136.7		56.3		64.6		96.9	

TABLE B-5 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	47	15.5	38	12.5	49	16.2	81	26.7	55	18.2	11	3.6	22	7.3
REP 2	42	13.7	43	14.0	50	16.3	91	29.6	46	15.0	12	3.9	23	7.5
REP 3	43	14.2	39	12.9	53	17.5	70	23.2	56	18.5	17	5.6	24	7.9
REP 4	43	13.7	47	15.0	44	14.0	98	31.2	58	18.5	4	1.3	20	6.4
REP 5	53	16.7	38	12.0	50	15.8	92	29.0	56	17.7	9	2.8	19	6.0
TOTAL	228	14.8	205	13.3	246	15.9	432	28.0	271	17.6	53	3.4	108	7.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	195	64.4	199	64.8	197	65.2	207	65.9	208	65.6	1006	65.2
DOUBLES(0-190)	82	27.1	81	26.4	79	26.2	86	27.4	85	26.8	413	26.8
MISSES(580-760)	13	4.3	13	4.2	19	6.3	11	3.5	15	4.7	71	4.6
DOUBLE MISS(>760)	13	4.3	14	4.6	7	2.3	10	3.2	9	2.8	53	3.4
MEAN SPACING(mm)	326.7		323.6		328.4		315.8		312.8		321.3	
COEF.OF VARI.(%)	61.3		57.0		59.2		58.8		58.0		58.8	

TABLE 8-6 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	23	19.0	10	8.3	14	11.6	7	5.8	9	7.4	6	5.0	52	43.0
REP 2	28	17.0	14	8.5	15	9.1	14	8.5	23	13.9	10	6.1	61	37.0
REP 3	35	21.9	15	9.4	14	8.8	12	7.5	12	7.5	9	5.6	63	39.4
REP 4	27	17.0	22	13.8	16	10.1	8	5.0	12	7.5	10	6.3	64	40.3
REP 5	43	24.7	23	13.2	14	8.0	14	8.0	7	4.0	16	9.2	57	32.8
TOTAL	156	20.0	84	10.8	73	9.4	55	7.1	63	8.1	51	6.5	297	38.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	36	29.8	59	35.8	45	28.1	47	29.6	52	29.9	239	30.7
DOUBLES(0-190)	32	26.4	42	25.5	49	30.6	47	29.6	63	36.2	233	29.9
MISSES(580-760)	8	6.6	19	11.5	18	11.3	19	11.9	11	6.3	75	9.6
DOUBLE MISS(>760)	45	37.2	45	27.3	48	30.0	46	28.9	48	27.6	232	29.8
MEAN SPACING(mm)	798.4		587.7		604.4		623.3		559.4		624.8	
COEF.OF VARI.(%)	109.3		89.5		95.9		102.8		104.0		102.4	

TABLE B-7 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	15	6.1	28	11.5	39	16.0	49	20.1	56	23.0	21	8.6	36	14.8
REP 2	11	5.1	14	6.5	28	13.0	54	25.1	39	18.1	24	11.2	45	20.9
REP 3	21	8.8	24	10.1	29	12.2	47	19.7	48	20.2	25	10.5	44	18.5
REP 4	15	6.5	23	10.0	27	11.7	47	20.3	45	19.5	26	11.3	48	20.8
REP 5	14	5.9	21	8.9	42	17.7	45	19.0	44	18.6	36	15.2	35	14.8
TOTAL	76	6.5	110	9.4	165	14.2	242	20.8	232	19.9	132	11.3	208	17.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	168	68.9	139	64.7	144	60.5	140	60.6	161	67.9	752	64.5
DOUBLES(0-190)	38	15.6	24	11.2	43	18.1	36	15.6	33	13.9	174	14.9
MISSES(580-760)	23	9.4	28	13.0	34	14.3	37	16.0	26	11.0	148	12.7
DOUBLE MISS(>760)	15	6.1	24	11.2	17	7.1	18	7.8	17	7.2	91	7.8
MEAN SPACING(mm)	406.0		460.8		413.6		431.0		418.1		425.1	
COEF.OF VARI.(%)	55.2		58.0		56.0		52.7		51.1		54.8	

TABLE B-8 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	9	8.6	7	6.7	8	7.6	9	8.6	7	6.7	8	7.6	57	54.3
REP 2	8	6.6	8	6.6	11	9.0	11	9.0	10	8.2	7	5.7	67	54.9
REP 3	11	10.1	4	3.7	12	11.0	10	9.2	8	7.3	5	4.6	59	54.1
REP 4	14	9.4	16	10.7	24	16.1	18	12.1	10	6.7	9	6.0	58	38.9
REP 5	13	9.9	7	5.3	13	9.9	16	12.2	15	11.5	12	9.2	55	42.0
TOTAL	55	8.9	42	6.8	68	11.0	64	10.4	50	8.1	41	6.7	296	48.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	30	28.6	39	32.0	35	32.1	61	40.9	53	40.5	218	35.4
DOUBLES(0-190)	16	15.2	15	12.3	14	12.8	28	18.8	19	14.5	92	14.9
MISSES(580-760)	14	13.3	13	10.7	11	10.1	18	12.1	20	15.3	76	12.3
DOUBLE MISS(>760)	45	42.9	55	45.1	49	45.0	42	28.2	39	29.8	230	37.3
MEAN SPACING(mm)	924.9		792.2		899.2		611.2		747.3		780.4	
COEF.OF VARI.(%)	92.8		81.9		96.7		90.1		98.1		94.2	

TABLE B-9 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	35	15.4	26	11.4	30	13.2	34	14.9	26	11.4	25	11.0	52	22.8
REP 2	45	17.4	37	14.3	37	14.3	36	13.9	33	12.7	21	8.1	50	19.3
REP 3	44	16.9	43	16.5	44	16.9	26	10.0	29	11.1	26	10.0	49	18.8
REP 4	39	15.5	30	11.9	40	15.9	32	12.7	47	18.7	19	7.5	45	17.9
REP 5	33	13.4	24	9.7	49	19.8	32	13.0	44	17.8	28	11.3	37	15.0
TOTAL	196	15.7	160	12.8	200	16.0	160	12.8	179	14.4	119	9.5	233	18.7

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	111	48.7	123	47.5	124	47.5	134	53.2	148	59.9	640	51.3
DOUBLES(0-190)	58	25.4	80	30.9	83	31.8	67	26.6	57	23.1	345	27.7
MISSES(580-760)	32	14.0	26	10.0	27	10.3	28	11.1	13	5.3	126	10.1
DOUBLE MISS(>760)	27	11.8	30	11.6	27	10.3	23	9.1	29	11.7	136	10.9
MEAN SPACING(mm)	431.7		382.9		377.7		390.3		400.9		395.8	
COEF.OF VARI.(%)	77.1		76.0		76.3		72.6		72.0		75.0	

TABLE B-10 SPACINGS OF SEEDS FOR -

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	41	20.6	22	11.1	25	12.6	18	9.0	23	11.6	14	7.0	56	28.1
REP 2	39	19.6	34	17.1	18	9.0	19	9.5	15	7.5	13	6.5	61	30.7
REP 3	35	18.4	22	11.6	23	12.1	16	8.4	16	8.4	13	6.8	65	34.2
REP 4	19	15.3	14	11.3	12	9.7	8	6.5	8	6.5	8	6.5	55	44.4
REP 5	29	16.5	23	13.1	21	11.9	21	11.9	7	4.0	10	5.7	65	36.9
TOTAL	163	18.4	115	13.0	99	11.1	82	9.2	69	7.8	58	6.5	302	34.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	78	39.2	64	32.2	59	31.1	36	29.0	58	33.0	295	33.2
DOUBLES(0-190)	62	31.2	71	35.7	56	29.5	32	25.8	50	28.4	271	30.5
MISSES(580-760)	10	5.0	21	10.6	29	15.3	12	9.7	24	13.6	96	10.8
DOUBLE MISS(>760)	49	24.6	43	21.6	46	24.2	44	35.5	44	25.0	226	25.5
MEAN SPACING(mm)	496.8		497.1		511.4		768.2		555.0		549.4	
COEF.OF VARI.(%)	97.3		103.5		85.8		112.2		99.3		103.5	

TABLE B-11 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	15	8.6	14	8.0	21	12.1	21	12.1	21	12.1	19	10.9	63	36.2
REP 2	25	14.0	15	8.4	16	8.9	20	11.2	17	9.5	17	9.5	69	38.5
REP 3	31	16.0	20	10.3	19	9.8	22	11.3	20	10.3	7	3.6	75	38.7
REP 4	17	8.4	21	10.4	28	13.9	26	12.9	33	16.3	17	8.4	60	29.7
REP 5	27	14.6	15	8.1	19	10.3	29	15.7	17	9.2	19	10.3	59	31.9
TOTAL	115	12.3	85	9.1	103	11.0	118	12.6	108	11.6	79	8.5	326	34.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	79	45.4	65	36.3	68	35.1	97	48.0	83	44.9	392	42.0
DOUBLES(0-190)	26	14.9	40	22.3	49	25.3	38	18.8	38	20.5	191	20.4
MISSES(580-760)	30	17.2	28	15.6	30	15.5	31	15.3	22	11.9	141	15.1
DOUBLE MISS(>760)	39	22.4	46	25.7	47	24.2	36	17.8	42	22.7	210	22.5
MEAN SPACING(mm)	568.1		548.8		511.6		488.7		535.2		529.0	
COEF.OF VARI.(%)	85.5		72.8		76.4		71.6		83.2		78.4	

TABLE B-12 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	12	8.1	12	8.1	13	8.7	9	6.0	18	12.1	10	6.7	75	50.3
REP 2	22	13.6	14	8.6	12	7.4	15	9.3	18	11.1	14	8.6	67	41.4
REP 3	8	5.3	5	3.3	4	2.7	14	9.3	15	10.0	24	16.0	80	53.3
REP 4	11	6.6	8	4.8	6	3.6	14	8.4	26	15.6	21	12.6	81	48.5
REP 5	10	5.8	8	4.6	9	5.2	25	14.5	21	12.1	18	10.4	82	47.4
TOTAL	63	7.9	47	5.9	44	5.5	77	9.6	98	12.2	87	10.9	385	48.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	46	30.9	59	36.4	54	36.0	63	37.7	70	40.5	292	36.5
DOUBLES(0-190)	24	16.1	34	21.0	13	8.7	19	11.4	18	10.4	108	13.5
MISSES(580-760)	30	20.1	23	14.2	30	20.0	38	22.8	42	24.3	163	20.3
DOUBLE MISS(>760)	49	32.9	46	28.4	53	35.3	47	28.1	43	24.9	238	29.7
MEAN SPACING(mm)	667.9		614.1		657.8		589.0		568.0		617.1	
COEF OF VARI.(%)	70.3		80.7		50.2		50.1		49.4		62.1	

TABLE B-13 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	41	16.0	30	11.7	35	13.7	54	21.1	28	10.9	21	8.2	47	18.4
REP 2	45	16.8	39	14.6	34	12.7	43	16.0	38	14.2	21	7.8	48	17.9
REP 3	50	16.5	50	16.5	42	13.9	66	21.8	43	14.2	21	6.9	31	10.2
REP 4	49	17.1	41	14.3	37	12.9	55	19.2	47	16.4	20	7.0	38	13.2
REP 5	51	17.5	33	11.3	54	18.5	54	18.5	42	14.4	23	7.9	35	12.0
TOTAL	236	16.8	193	13.7	202	14.4	272	19.3	198	14.1	106	7.5	199	14.2

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	137	53.5	131	48.9	172	56.8	160	55.7	174	59.6	774	55.0
DOUBLES(0-190)	67	26.2	81	30.2	95	31.4	83	28.9	81	27.7	407	28.9
MISSES(580-760)	27	10.5	33	12.3	23	7.6	25	8.7	21	7.2	129	9.2
DOUBLE MISS(>760)	25	9.8	23	8.6	13	4.3	19	6.6	16	5.5	96	6.8
MEAN SPACING(mm)	388.1		367.8		326.2		345.6		340.0		352.2	
COEF.OF VARI.(%)	70.0		70.1		65.6		67.4		67.3		68.5	

TABLE B-14 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	10	8.3	15	12.4	9	7.4	14	11.6	8	6.6	7	5.8	58	47.9
REP 2	11	8.9	7	5.6	15	12.1	10	8.1	12	9.7	6	4.8	63	50.8
REP 3	15	12.6	12	10.1	6	5.0	6	5.0	10	8.4	8	6.7	62	52.1
REP 4	26	17.3	22	14.7	15	10.0	10	6.7	10	6.7	6	4.0	61	40.7
REP 5	33	21.4	19	12.3	6	3.9	12	7.8	8	5.2	10	6.5	66	42.9
TOTAL	95	14.2	75	11.2	51	7.6	52	7.8	48	7.2	37	5.5	310	46.4

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	37	30.6	42	33.9	29	24.4	38	25.3	33	21.4	179	26.8
DOUBLES(0-190)	24	19.8	18	14.5	25	21.0	48	32.0	52	33.8	167	25.0
MISSES(580-760)	10	8.3	8	6.5	18	15.1	17	11.3	16	10.4	69	10.3
DOUBLE MISS(>760)	50	41.3	56	45.2	47	39.5	47	31.3	53	34.4	253	37.9
MEAN SPACING(mm)	816.1		794.5		821.9		657.7		635.3		735.9	
COEF.OF VARI.(%)	104.1		83.5		95.3		111.3		94.8		98.8	

TABLE B-15 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	18	9.6	11	5.9	23	12.2	27	14.4	29	15.4	17	9.0	63	33.5
REP 2	18	9.0	20	10.0	22	10.9	26	12.9	30	14.9	22	10.9	63	31.3
REP 3	22	11.6	18	9.5	18	9.5	28	14.8	26	13.8	16	8.5	61	32.3
REP 4	25	12.1	16	7.8	20	9.7	32	15.5	34	16.5	24	11.7	55	26.7
REP 5	20	10.2	19	9.7	21	10.7	27	13.8	19	9.7	24	12.2	66	33.7
TOTAL	103	10.5	84	8.6	104	10.6	140	14.3	138	14.1	103	10.5	308	31.4

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	90	47.9	95	47.3	88	46.6	105	51.0	88	44.9	466	47.6
DOUBLES(0-190)	29	15.4	37	18.4	37	19.6	40	19.4	37	18.9	180	18.4
MISSES(580-760)	30	16.0	40	19.9	25	13.2	23	11.2	34	17.3	152	15.5
DOUBLE MISS(>760)	39	20.7	29	14.4	39	20.6	38	18.4	37	18.9	182	18.6
MEAN SPACING(mm)	529.5		493.7		520.8		480.5		505.2		505.3	
COEF.OF VARI.(%)	66.2		66.7		74.5		65.3		65.1		67.7	

TABLE B-16 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 380 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	7	7.1	7	7.1	5	5.1	5	5.1	10	10.2	5	5.1	59	60.2
REP 2	11	9.7	11	9.7	10	8.8	7	6.2	8	7.1	9	8.0	57	50.4
REP 3	7	6.1	9	7.9	13	11.4	7	6.1	14	12.3	8	7.0	56	49.1
REP 4	14	12.5	4	3.6	5	4.5	11	9.8	7	6.3	6	5.4	65	58.0
REP 5	3	3.2	8	8.4	6	6.3	7	7.4	9	9.5	11	11.6	51	53.7
TOTAL	42	7.9	39	7.3	39	7.3	37	7.0	48	9.0	39	7.3	288	54.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(200-570)	24	24.5	30	26.5	42	36.8	26	23.2	29	30.5	151	28.4
DOUBLES(0-190)	13	13.3	22	19.5	14	12.3	18	16.1	11	11.6	78	14.7
MISSES(580-760)	11	11.2	11	9.7	16	14.0	15	13.4	13	13.7	66	12.4
DOUBLE MISS(>760)	50	51.0	50	44.2	42	36.8	53	47.3	42	44.2	237	44.5
MEAN SPACING(mm)	960.3		869.2		860.4		856.7		985.6		902.2	
COEF.OF VARI.(%)	80.6		91.2		97.9		83.1		101.6		91.4	

TABLE B-17 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	68	19.3	57	16.2	80	22.7	68	19.3	40	11.4	22	6.3	17	4.8
REP 2	66	18.6	77	21.7	77	21.7	58	16.3	36	10.1	18	5.1	23	6.5
REP 3	65	18.5	54	15.3	81	23.0	76	21.6	37	10.5	22	6.3	17	4.8
REP 4	54	14.7	42	11.4	146	39.8	68	18.5	39	10.6	14	3.8	4	1.1
REP 5	63	17.6	35	9.8	121	33.8	76	21.2	34	9.5	18	5.0	11	3.1
TOTAL	316	17.7	265	14.9	505	28.3	346	19.4	186	10.4	94	5.3	72	4.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	189	53.7	184	51.8	188	53.4	226	61.6	215	60.1	1002	56.2
DOUBLES(0-120)	76	21.6	82	23.1	77	21.9	71	19.3	77	21.5	383	21.5
MISSES(390-500)	48	13.6	48	13.5	48	13.6	52	14.2	37	10.3	233	13.1
DOUBLE MISS(>500)	39	11.1	41	11.5	39	11.1	18	4.9	29	8.1	166	9.3
MEAN SPACING(mm)	281.4		279.9		282.5		270.2		276.2		278.0	
COEF.OF VARI.(%)	61.3		71.7		62.1		50.5		55.7		60.7	

TABLE B-18 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	73	22.7	63	19.6	50	15.6	49	15.3	30	9.3	19	5.9	37	11.5
REP 2	84	24.6	78	22.9	45	13.2	43	12.6	36	10.6	18	5.3	37	10.9
REP 3	22	8.3	23	8.7	62	23.5	58	22.0	38	14.4	27	10.2	34	12.9
REP 4	32	11.0	26	8.9	89	30.5	71	24.3	36	12.3	7	2.4	31	10.6
REP 5	25	8.8	24	8.4	82	28.8	63	22.1	41	14.4	22	7.7	28	9.8
TOTAL	236	15.7	214	14.2	328	21.8	284	18.9	181	12.0	93	6.2	167	11.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	134	41.7	140	41.1	125	47.3	172	58.9	149	52.3	720	47.9
DOUBLES(0-120)	87	27.1	106	31.1	29	11.0	37	12.7	35	12.3	294	19.6
MISSES(390-500)	44	13.7	40	11.7	49	18.6	45	15.4	51	17.9	229	15.2
DOUBLE MISS(>500)	56	17.4	55	16.1	61	23.1	38	13.0	50	17.5	260	17.3
MEAN SPACING(mm)	309.7		289.6		375.7		338.9		346.4		329.4	
COEF.OF VARI.(%)	79.9		86.4		55.2		63.4		57.0		69.2	

TABLE B-19 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	33	11.7	44	15.5	51	18.0	60	21.2	36	12.7	27	9.5	32	11.3
REP 2	40	13.3	48	16.0	58	19.3	64	21.3	37	12.3	22	7.3	31	10.3
REP 3	34	11.3	40	13.3	67	22.3	62	20.7	47	15.7	31	10.3	19	6.3
REP 4	22	8.1	27	9.9	55	20.2	66	24.3	46	16.9	30	11.0	26	9.6
REP 5	4	1.5	12	4.6	55	20.9	85	32.3	64	24.3	34	12.9	9	3.4
TOTAL	133	9.4	171	12.1	286	20.2	337	23.8	230	16.2	144	10.2	117	8.3

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	125	44.2	152	50.7	138	46.0	124	45.6	140	53.2	679	47.9
DOUBLES(0-120)	45	15.9	49	16.3	52	17.3	35	12.9	4	1.5	185	13.0
MISSES(390-500)	54	19.1	46	15.3	60	20.0	57	21.0	76	28.9	293	20.7
DOUBLE MISS(>500)	59	20.8	53	17.7	50	16.7	56	20.6	43	16.3	261	18.4
MEAN SPACING(mm)	352.2		331.4		330.4		364.1		376.4		350.0	
COEF.OF VARI.(%)	67.8		61.4		52.4		50.4		32.8		54.2	

TABLE B-20 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	26	14.3	28	15.4	25	13.7	16	8.8	17	9.3	10	5.5	60	33.0
REP 2	31	14.8	28	13.4	34	16.3	25	12.0	19	9.1	15	7.2	57	27.3
REP 3	31	13.7	44	19.5	35	15.5	22	9.7	20	8.8	21	9.3	53	23.5
REP 4	14	7.1	20	10.2	28	14.3	31	15.8	22	11.2	13	6.6	68	34.7
REP 5	15	6.8	24	10.9	39	17.6	37	16.7	36	16.3	18	8.1	52	23.5
TOTAL	117	11.3	144	13.9	161	15.6	131	12.7	114	11.0	77	7.4	290	28.0

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	60	33.0	74	35.4	82	36.3	72	36.7	87	39.4	375	36.3
DOUBLES(0-120)	32	17.6	39	18.7	43	19.0	17	8.7	21	9.5	152	14.7
MISSES(390-500)	20	11.0	24	11.5	27	11.9	26	13.3	43	19.5	140	13.5
DOUBLE MISS(>500)	70	38.5	72	34.4	74	32.7	81	41.3	70	31.7	367	35.5
MEAN SPACING(mm)	544.0		472.5		437.7		506.1		448.0		478.6	
COEF.OF VARI.(%)	99.5		85.2		88.6		64.4		65.3		82.6	

TABLE B-21 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	83	22.9	62	17.1	71	19.6	69	19.1	34	9.4	26	7.2	17	4.7
REP 2	83	22.1	78	20.7	77	20.5	76	20.2	22	5.9	19	5.1	21	5.6
REP 3	60	15.3	80	20.5	124	31.7	69	17.6	38	9.7	17	4.3	3	0.8
REP 4	69	17.6	60	15.3	136	34.7	66	16.8	38	9.7	19	4.8	4	1.0
REP 5	75	19.1	57	14.5	149	38.0	49	12.5	33	8.4	18	4.6	11	2.8
TOTAL	370	19.3	337	17.6	557	29.1	329	17.2	165	8.6	99	5.2	56	2.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	179	49.4	204	54.3	241	61.6	237	60.5	229	58.4	1090	57.0
DOUBLES(0-120)	93	25.7	98	26.1	89	22.8	92	23.5	96	24.5	468	24.5
MISSES(390-500)	47	13.0	34	9.0	41	10.5	40	10.2	38	9.7	200	10.5
DOUBLE MISS(>500)	43	11.9	40	10.6	20	5.1	23	5.9	29	7.4	155	8.1
MEAN SPACING(mm)	272.9		263.8		254.2		253.8		254.0		259.5	
COEF.OF VARI.(%)	66.1		68.6		53.4		55.5		61.7		61.5	

TABLE B-22 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	47	20.0	37	15.7	36	15.3	25	10.6	18	7.7	20	8.5	52	22.1
REP 2	75	27.5	37	13.6	37	13.6	32	11.7	16	5.9	12	4.4	64	23.4
REP 3	13	6.7	18	9.3	30	15.5	27	14.0	21	10.9	19	9.8	65	33.7
REP 4	18	8.0	19	8.5	40	17.9	41	18.3	34	15.2	20	8.9	52	23.2
REP 5	21	9.4	14	6.3	53	23.7	35	15.6	23	10.3	18	8.0	60	26.8
TOTAL	174	15.1	125	10.9	196	17.1	160	13.9	112	9.7	89	7.7	293	25.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	80	34.0	102	37.4	69	35.8	96	42.9	91	40.6	438	38.1
DOUBLES(0-120)	60	25.5	77	28.2	15	7.8	19	8.5	26	11.6	197	17.1
MISSES(390-500)	23	9.8	18	6.6	25	13.0	37	16.5	29	12.9	132	11.5
DOUBLE MISS(>500)	72	30.6	76	27.8	84	43.5	72	32.1	78	34.8	382	33.2
MEAN SPACING(mm)	421.0		364.8		512.0		442.4		441.5		431.1	
COEF.OF VARI.(%)	95.5		96.2		63.5		63.6		62.6		77.7	

TABLE B-23 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	13	5.0	27	10.3	49	18.7	82	31.3	30	11.5	27	10.3	34	13.0
REP 2	9	3.3	19	6.9	80	29.1	89	32.4	33	12.0	22	8.0	23	8.4
REP 3	1	0.4	20	7.6	56	21.3	79	30.0	68	25.9	24	9.1	15	5.7
REP 4	4	1.3	42	14.0	77	25.7	95	31.7	54	18.0	22	7.3	6	2.0
REP 5	8	2.6	30	9.9	85	28.1	110	36.3	56	18.5	12	4.0	2	0.7
TOTAL	35	2.5	138	9.8	347	24.7	455	32.4	241	17.2	107	7.6	80	5.7

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	142	54.2	164	59.6	138	52.5	203	67.7	210	69.3	857	61.1
DOUBLES(0-120)	18	6.9	14	5.1	2	0.8	10	3.3	9	3.0	53	3.8
MISSES(390-500)	41	15.6	52	18.9	84	31.9	59	19.7	70	23.1	306	21.8
DOUBLE MISS(>500)	61	23.3	45	16.4	39	14.8	28	9.3	14	4.6	187	13.3
MEAN SPACING(mm)	378.5		361.7		377.3		329.9		326.4		353.3	
COEF.OF VARI.(%)	47.3		44.1		34.2		38.9		34.8		40.9	

TABLE B-24 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 5 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	40	15.1	37	14.0	51	19.2	45	17.0	37	14.0	11	4.2	44	16.6
REP 2	43	15.8	40	14.7	45	16.5	55	20.1	34	12.5	10	3.7	46	16.8
REP 3	20	7.8	23	8.9	35	13.6	75	29.2	45	17.5	27	10.5	32	12.5
REP 4	21	8.9	14	6.0	39	16.6	51	21.7	44	18.7	22	9.4	44	18.7
REP 5	25	10.3	28	11.6	46	19.0	36	14.9	29	12.0	22	9.1	56	23.1
TOTAL	149	11.7	142	11.2	216	17.0	262	20.6	189	14.9	92	7.2	222	17.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	120	45.3	128	46.9	117	45.5	98	41.7	104	43.0	567	44.6
DOUBLES(0-120)	43	16.2	51	18.7	26	10.1	23	9.8	27	11.2	170	13.4
MISSES(390-500)	47	17.7	38	13.9	55	21.4	48	20.4	33	13.6	221	17.4
DOUBLE MISS(>500)	55	20.8	56	20.5	59	23.0	66	28.1	78	32.2	314	24.7
MEAN SPACING(mm)	373.9		359.9		385.5		420.1		409.5		388.5	
COEF.OF VARI.(%)	80.0		72.1		53.0		57.1		60.0		65.1	

TABLE B-25 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	49	16.7	43	14.6	66	22.4	46	15.6	27	9.2	19	6.5	44	15.0
REP 2	52	17.4	42	14.1	52	17.4	49	16.4	43	14.4	25	8.4	35	11.7
REP 3	23	8.2	29	10.4	54	19.4	69	24.7	51	18.3	32	11.5	21	7.5
REP 4	35	11.8	23	7.7	66	22.2	76	25.6	53	17.8	24	8.1	20	6.7
REP 5	39	12.7	31	10.1	82	26.6	66	21.4	46	14.9	19	6.2	25	8.1
TOTAL	198	13.4	168	11.4	320	21.7	306	20.7	220	14.9	119	8.1	145	9.8

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	140	47.6	124	41.6	122	43.7	147	49.5	152	49.4	685	46.4
DOUBLES(0-120)	59	20.1	61	20.5	42	15.1	47	15.8	56	18.2	265	18.0
MISSES(390-500)	32	10.9	53	17.8	62	22.2	59	19.9	56	18.2	262	17.8
DOUBLE MISS(>500)	63	21.4	60	20.1	53	19.0	44	14.8	44	14.3	264	17.9
MEAN SPACING(mm)	336.0		334.8		355.8		334.1		321.6		336.1	
COEF.OF VARI.(%)	73.4		68.1		51.2		50.6		55.4		60.4	

TABLE 8-26 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	65	22.3	49	16.8	45	15.5	36	12.4	27	9.3	25	8.6	44	15.1
REP 2	69	22.6	53	17.4	48	15.7	47	15.4	27	8.9	16	5.2	45	14.8
REP 3	26	9.4	34	12.3	54	19.6	68	24.6	43	15.6	19	6.9	32	11.6
REP 4	27	9.9	28	10.3	50	18.3	69	25.3	44	16.1	26	9.5	29	10.6
REP 5	28	10.3	32	11.7	48	17.6	66	24.2	42	15.4	26	9.5	31	11.4
TOTAL	215	15.2	196	13.8	245	17.3	286	20.2	183	12.9	112	7.9	181	12.8

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	119	40.9	134	43.9	128	46.4	138	50.5	128	46.9	647	45.6
DOUBLES(0-120)	71	24.4	79	25.9	47	17.0	31	11.4	39	14.3	267	18.8
MISSES(390-500)	32	11.0	31	10.2	50	18.1	49	17.9	49	17.9	211	14.9
DOUBLE MISS(>500)	69	23.7	61	20.0	51	18.5	55	20.1	57	20.9	293	20.7
MEAN SPACING(mm)	340.5		323.5		358.7		362.4		363.5		349.0	
COEF.OF VARI.(%)	83.1		82.5		59.0		53.8		56.8		67.8	

TABLE B-27 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	32	13.5	39	16.5	30	12.7	34	14.3	27	11.4	29	12.2	46	19.4
REP 2	41	17.2	22	9.2	32	13.4	35	14.7	30	12.6	20	8.4	58	24.4
REP 3	21	8.8	21	8.8	22	9.2	65	27.3	35	14.7	33	13.9	41	17.2
REP 4	28	12.2	12	5.2	20	8.7	62	27.0	35	15.2	29	12.6	44	19.1
REP 5	25	11.0	14	6.2	29	12.8	51	22.5	27	11.9	23	10.1	58	25.6
TOTAL	147	12.6	108	9.2	133	11.4	247	21.1	154	13.2	134	11.5	247	21.1

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	89	37.6	74	31.1	93	39.1	79	34.3	82	36.1	417	35.6
DOUBLES(0-120)	41	17.3	47	19.7	30	12.6	37	16.1	34	15.0	189	16.2
MISSES(390-500)	32	13.5	39	16.4	41	17.2	41	17.8	30	13.2	183	15.6
DOUBLE MISS(>500)	75	31.6	78	32.8	74	31.1	73	31.7	81	35.7	381	32.6
MEAN SPACING(mm)	414.0		415.6		413.1		428.0		436.6		421.3	
COEF.OF VARI.(%)	75.9		70.2		51.0		54.3		56.1		62.1	

TABLE 8-28 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NORLAND, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	23	13.0	20	11.3	18	10.2	22	12.4	20	11.3	17	9.6	57	32.2
REP 2	20	13.2	9	6.0	23	15.2	5	3.3	17	11.3	10	6.6	67	44.4
REP 3	13	7.7	22	13.1	21	12.5	20	11.9	13	7.7	8	4.8	71	42.3
REP 4	26	17.1	23	15.1	10	6.6	18	11.8	13	8.6	8	5.3	54	35.5
REP 5	13	8.8	19	12.9	22	15.0	8	5.4	7	4.8	13	8.8	65	44.2
TOTAL	95	11.9	93	11.7	94	11.8	73	9.2	70	8.8	56	7.0	314	39.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	49	27.7	33	21.9	56	33.3	45	29.6	41	27.9	224	28.2
DOUBLES(0-120)	28	15.8	23	15.2	19	11.3	30	19.7	20	13.6	120	15.1
MISSES(390-500)	26	14.7	18	11.9	14	8.3	15	9.9	8	5.4	81	10.2
DOUBLE MISS(>500)	74	41.8	77	51.0	79	47.0	62	40.8	78	53.1	370	46.5
MEAN SPACING(mm)	560.9		648.4		585.8		651.4		670.5		620.4	
COEF.OF VARI.(%)	90.1		82.7		82.0		136.2		87.5		98.6	

TABLE B-29 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	61	20.5	50	16.8	47	15.8	49	16.4	32	10.7	17	5.7	42	14.1
REP 2	70	23.9	42	14.3	46	15.7	42	14.3	26	8.9	15	5.1	52	17.7
REP 3	50	16.6	42	13.9	52	17.2	64	21.2	47	15.6	16	5.3	31	10.3
REP 4	47	14.9	38	12.0	79	25.0	59	18.7	48	15.2	22	7.0	23	7.3
REP 5	58	18.1	28	8.8	73	22.8	69	21.6	48	15.0	26	8.1	18	5.6
TOTAL	286	18.7	200	13.1	297	19.4	283	18.5	201	13.1	96	6.3	166	10.9

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	128	43.0	108	36.9	136	45.0	150	47.5	147	45.9	669	43.8
DOUBLES(0-120)	67	22.5	82	28.0	66	21.9	62	19.6	70	21.9	347	22.7
MISSES(390-500)	44	14.8	36	12.3	53	17.5	59	18.7	59	18.4	251	16.4
DOUBLE MISS(>500)	59	19.8	67	22.9	47	15.6	45	14.2	44	13.8	262	17.1
MEAN SPACING(mm)	333.3		336.2		327.4		313.7		310.3		323.8	
COEF.OF VARI.(%)	80.2		82.5		67.9		60.0		58.7		70.9	

TABLE B-30 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 40 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	30	15.2	28	14.2	25	12.7	21	10.7	15	7.6	10	5.1	68	34.5
REP 2	14	7.4	4	2.1	24	12.7	26	13.8	24	12.7	30	15.9	67	35.4
REP 3	48	21.2	30	13.3	28	12.4	21	9.3	23	10.2	18	8.0	58	25.7
REP 4	14	6.8	14	6.8	32	15.5	33	16.0	26	12.6	24	11.7	63	30.6
REP 5	14	6.6	15	7.1	36	17.1	36	17.1	17	8.1	35	16.6	58	27.5
TOTAL	120	11.7	91	8.8	145	14.1	137	13.3	105	10.2	117	11.4	314	30.5

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	68	34.5	51	27.0	65	28.8	73	35.4	78	37.0	335	32.6
DOUBLES(0-120)	34	17.3	14	7.4	58	25.7	15	7.3	18	8.5	139	13.5
MISSES(390-500)	17	8.6	27	14.3	27	11.9	31	15.0	22	10.4	124	12.1
DOUBLE MISS(>500)	78	39.6	97	51.3	76	33.6	87	42.2	93	44.1	431	41.9
MEAN SPACING(mm)	498.7		520.2		438.3		479.6		465.6		478.8	
COEF.OF VARI.(%)	89.8		52.2		88.7		56.5		56.3		70.6	

TABLE B-31 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- END PIECES

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	27	12.1	32	14.3	29	13.0	28	12.6	22	9.9	25	11.2	60	26.9
REP 2	23	10.8	21	9.9	30	14.2	42	19.8	19	9.0	19	9.0	58	27.4
REP 3	2	0.8	24	9.8	47	19.2	74	30.2	41	16.7	23	9.4	34	13.9
REP 4	3	1.3	20	8.4	47	19.8	57	24.1	40	16.9	33	13.9	37	15.6
REP 5	4	1.8	11	4.9	43	19.2	53	23.7	40	17.9	27	12.1	46	20.5
TOTAL	59	5.2	108	9.5	196	17.2	254	22.3	162	14.2	127	11.1	235	20.6

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	75	33.6	73	34.4	131	53.5	114	48.1	97	43.3	490	42.9
DOUBLES(0-120)	36	16.1	29	13.7	5	2.0	5	2.1	6	2.7	81	7.1
MISSES(390-500)	27	12.1	33	15.6	52	21.2	48	20.3	48	21.4	208	18.2
DOUBLE MISS(>500)	85	38.1	77	36.3	57	23.3	70	29.5	73	32.6	362	31.7
MEAN SPACING(mm)	443.6		466.0		404.1		418.4		442.9		433.9	
COEF.OF VARI.(%)	71.3		72.6		46.6		45.7		46.4		58.6	

TABLE B-32 SPACINGS OF SEEDS FOR

PLANTER -- ACME(CUP TYPE), SPEED -- 8 km/h, SPACE SETTING -- 250 mm
SEED CULTIVAR -- NETTED GEM, SIZE -- 60 g, SHAPE -- CENTER CUT

NUMBER AND PERCENTAGE OF SEEDS DROPPED AS PER SPACE GROUPS (mm)

	0-100		110-200		210-300		310-400		410-500		510-600		OVER 600	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
REP 1	29	13.4	33	15.2	23	10.6	29	13.4	30	13.8	12	5.5	61	28.1
REP 2	38	18.5	19	9.3	27	13.2	16	7.8	20	9.8	21	10.2	64	31.2
REP 3	14	7.1	12	6.1	22	11.1	21	10.6	36	18.2	27	13.6	66	33.3
REP 4	19	9.6	19	9.6	27	13.6	24	12.1	24	12.1	17	8.6	68	34.3
REP 5	14	6.9	24	11.8	25	12.3	31	15.2	24	11.8	22	10.8	64	31.4
TOTAL	114	11.2	107	10.5	124	12.1	121	11.8	134	13.1	99	9.7	323	31.6

	REP 1		REP 2		REP 3		REP 4		REP 5		TOTAL	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
SINGLES(130-380)	77	35.5	52	25.4	48	24.2	60	30.3	72	35.3	309	30.2
DOUBLES(0-120)	32	14.7	42	20.5	18	9.1	25	12.6	18	8.8	135	13.2
MISSES(390-500)	35	16.1	26	12.7	39	19.7	28	14.1	28	13.7	156	15.3
DOUBLE MISS(>500)	73	33.6	85	41.5	93	47.0	85	42.9	86	42.2	422	41.3
MEAN SPACING(mm)	455.3		482.7		500.2		498.3		482.9		483.3	
COEF.OF VARI.(%)	77.7		82.8		53.5		65.4		62.5		68.9	